PERSONALITIES

By George F. Taubeneck

Patterson Contributions

Response to our story about John H. Patterson, who developed the specialty selling formula during his tenure as president of the National Cash Register Co., has been more than gratifying. Many readers have written us letters about it (some containing addenda to the story), and still more have dropped into the office to talk about it.

Result is that we have accumulated enough material for a couple of additional instalments. This material will not follow a definite pattern or logical sequence, but is presented more or less in the order that it was reported to us by various individuals.

Some of the best contributors prefer to remain anonymous. Still others would not tell us particularly juicy anecdotes until we had given oath that we would not reprint them. But all in all, the information submitted is most interesting, and much of it should be quite helpful to sales managers who need fodder for morning meetings, and to salesmen who want to get ahead. Proceed:

* * *

Over Night

E. H. Walker, sales consultant of Toledo, who spent 12 years with N.C.R. (beginning as a salesman) recalls the circumstances attending the closing of the employee's dining room at the N.C.R.

"I happened to be a witness," states Mr. Walker, "because I was a guest that evening at the improvised hotel which Mr. Patterson had provided at the factory, owing to a disagreement he had had with all of the downtown hotels.

"At the time referred to Mr. Patterson gave orders one evening to change the employee's dining room into a riding academy over night. I personally witnessed a large force of men feverishly working against time. The building was large—the floors must come up—all supports removed—ground leveled and covered with tanbark.

"Orders from 'J.H.P.' meant orders—and no foolin'. I left a call for 5 a.m. and at 5:30 a.m., I personally witnessed J. H. Patterson, heading his entire force of executives, horseback riding in this same building on tanbark."

* * *

Verbatim Record

Mildred Scott of the Boston branch of the Kelvinator Corp., relates a tale about one occasion when Mr. Patterson visited one of *his* branches and found a salesman just beginning a presentation.

Acting on the impulse of the moment, Mr. Patterson had a stenographer sit on the other side of the salesroom floor, taking down the entire sales story as it was told to the prospect by the salesman.

When the prospect left, said salesman was called into Mr. Patterson's office, and rebuked gently but firmly on the number of ridiculous and silly statements made during the sales talk.

The salesman immediately answered: "Why I *never* said those things!" Whereupon Mr. Patterson confronted him with the transcribed evidence. The salesman corrected his presentation, and became a star sales producer thereafter!

"Which only goes to show," says Miss Scott, "that sometimes we are so anxious to get that signature on the dotted line we unconsciously stray from the straight and narrow, letting our emotions and anxiety run away with us. Personally, I think this procedure of Mr. Patterson's would work out most profitably in most sales organizations today."

* * *

Contest Preparation

One former NCR man (a publicity-dodger) recalls that Mr. Patterson was extremely fussy about getting the most minute details of a contest arranged before announcing it. He recalls vividly a lecture John H. gave him one time about planning a sales contest—a lecture which indicated how thoroughly Mr. Patterson had thought the thing through—and a lecture which, because of the graphic Patterson manner of presentation, stuck forever in his mind. It went, he recalls, something like this:

First, you must decide what idea you intend to use, what *theme* around which you will build the contest. Perhaps you would like to repeat one of them which was successful. Or if you are considering some brand new theme, before you adopt it be sure that it *ties in* well with your business.

If it is a theme that has been used before sometime, somewhere, the chances are that it will have to be changed around a little bit to suit your needs; it will have to be reshaped here, give it some color there, perhaps toned down completely to fit your pocketbook.

Now, after your initial expense, how much money do you intend to spend on promotion? Maybe you don't even want any special promotion, but if you do, you must decide how many mailing pieces you are going to use. Special meetings must be planned for the duration of the contest—as well as for the beginning and end.

There must be someone who is given credit for the whole idea; it may be the president, or the sales manager, or someone else who is well-liked and who has the ability to inspire interest and enthusiasm on the part of the men.

Next you must decide on the method of scoring. You can give points on dollar volume, number of sales, achievement of quota, or comparison with previous records.

But no matter what method you use, it is wise to keep it from getting so involved that it moves beyond your control. And by all means to be sure that it in no way shows partiality or favoritism, and that everyone has the same chance to win. For you can be sure that if there is something wrong with the *fairness* of the plan, the men will object.

Prizes will probably give you a few torn hairs and wilted collars. Among other things, you must decide how much you intend to spend on them, just who will receive them, and what they shall be: money, badges or cups, useful articles, trips to the factory, tickets to a World's Series, or excursions in a chartered boat.

Whether or not you use registration blanks depends on how many men are entering the contest. And also it is up to you to work out a special report form, with a series of follow-up blanks. Announcement of the contest should give all the rules—explained lucidly and simply—list the prizes and create a desire for them (a booklet containing pictures of every prize—if merchandise is used—or of interesting scenes to be visited—if a trip is the prize—was considered essential), and do something to stir up excitement.

You may want to let the outside world know about the contest. Your plan may be so interesting that it will draw the attention of the general public to your business. If this does not mean immediate sales, it may at least mean that you have planted an idea which will bear fruit in the future. (Sometimes people "buy now" to help a salesman win something.)

It's going to require a good deal of showmanship on your part to put this contest across. If, from the very beginning, you can't get your salesmen to believe that this is a cracker-jack idea, that it is just the opportunity they have been waiting for, that you know what you are doing, and that you intend to have everything run just as it should, then there is little point in attempting it. You want to be sure you don't overlook any opportunities for showmanship and dramatics. Be sure that the salesmen *see* what winning may mean to them.

Last of all, consider how you can bring your contest to a Garrison finish, so that your salesmen will say, "Ah, that was a hum-dinger of a contest." Don't let it peter out so that by the time it is over, the organization will yawningly be glad to get back to the usual routine.

Don'ts for Salesmen

Here are some Patterson "don'ts" which are still quoted with almost Biblical reverence by the NCR:

"Don't belittle the buyer's opinions or methods.

"Don't antagonize him. Honey attracts more flies than vinegar.

"Don't argue. Seem to go along with the buyer.

"Don't assume that you know more about his business than he does.

"Don't trust to persuasion. Convince him.

"Don't dodge objections or questions. Answer them.

"Don't talk empty words. Say something.

"Don't talk all the time. Give the buyer a chance.

"Don't think you're whipped before you start.

"If you think he ought to have what you are trying to sell, make up your mind that you can and will sell it to him. Try to find the one way to close the sale. If you can't untie the knot, cut it."

* * *

Explaining Failures

A salesman fails, says the N.C.R. manual, because:

"He does not have a whole-hearted belief in his company, his goods, and himself.

"2. He does not study human nature and apply what he learns in making sales.

"3. He always looks on the dark side.

"4. He argues with the prospect, instead of answering objections.

"5. He does not take proper care of his health.

"6. He becomes too familiar with the prospect.

"7. He does not use advertising matter and circulars to advantage.

"8. He does not improve his methods by adopting new ideas and suggestions.

"9. He does not carry samples on the road.

"10. He is careless of his appearance, his samples, and his office.

"11. He lacks knowledge, judgment, and enthusiasm.

"12. He does not get out into the territory enough.

"13. He loses time criticising company policies, instead of giving them a fair trial.

"14. He spends too much time in the office looking after details, and not enough in the presence of prospects.

"15. He does not carry a portfolio containing properly arranged sales material."

* * *

Embarrassing Questions

Henry Theobald, a Patterson man who later built the business of the Toledo Scale Co. (at one time he ranked as the world's most successful cash register salesman), had a set of "embarrassing questions" he used to ask himself, to see whether or not he was doing a good job. Patterson-inspired, as no doubt they were, it seems fitting that they should be included here:

"1. Am I possessed of complete and up-to-date knowledge of my business?

"2. Am I delivering better results day by day?

"3. Are other men putting more pep into their work than I am?

"4. Do I get right down to business, and think and plan as much as I should?

"5. Am I as enthusiastic as I should be?

6. Am I giving as many hours as I should each day, and every day, to my work?

"7. Is there anything—personal business, pleasures or vices, debts or obligations—taking any part of my time or attention or thought away from this business, and destroying my efficiency?

"8. Am I giving the management my hearty support, or am I criticising by thought, word, or deed?

"9. Do I employ the company's methods, or am I ignoring their suggestions?

"10. Am I developing rapidly enough to keep in line with the progress of the company?"

Fully one-half the sales which were lost, Patterson felt, were missed because salesmen failed to make points clear, talked too fast, used confusing claims, or in some way failed to transfer their own mind-picture to the prospect.

Recognizing this stumbling block, the National Cash Register Co. furnished salesmen with scratch pads, which they were instructed to use in making a sales presentation. Outline charts were printed on these pads, which the salesman was supposed to complete as he developed his presentation.

It was one of John H. Patterson's hobbies to teach his salesmen to talk with pencils, as he did. He taught them how to draw "match" men, and how to illustrate and dramatize facts with crude drawings.

The "scratch pad" method, while not adaptable to all sorts of selling presentations, does embody an envisualization of these principles of specialty selling:

1. Evolving a logical and orderly "build up" of selling points.

2. Riveting the prospect's attention to what the salesman is saying—and never allowing his mind to wander.

3. Driving home important selling points, and making them stick by emphasis and repetition.

4. Presenting definite proof of all statements which are not self-evident.

* * *

Pays for Itself

The first "it pays for itself" argument on record is to be found in early N.C.R. manuals. This story so dear to the hearts of all specialty salesmen was revised many times; but most versions were substantially like the following:

"You agree that this National Cash Register will increase the efficiency of your clerks, enabling them to sell more goods.

"It is reasonable to believe that each clerk could sell five dollars' worth of goods more per day, and figuring 20 per cent gross profit, which would be net in this case, this would mean an increased profit of one dollar per day per clerk, or one hundred dollars per month for four clerks.

"This would mean a return of 100 per cent on your investment in 10 months. Should it require two years to pay for itself, you would have a 50 per cent yearly return on your investment."

* * *

Window Display

How can a particular window display make a definite impression on one who simply glances in as she walks by? That was one question which J. H. invariably asked when he looked at a new design submitted by his window display department.

It takes the average shopper from seven to thirty seconds to pass the window, he was fond of quoting, and in this length of time she should receive one predominant impression, one bugle-call reason for buying. The good display is like the good salesman, he would say; it should give the customer news about the product and show her why she should buy.

A window display, he believed, is one of the best advertising mediums in existence, for it reaches many people at such a slight expense. He estimated that in a town of average population, any centrally located corner will get a traffic of passersby in volume equal to that of the entire population within a specified week.

* * *

End of the Street

To demonstrate how Mr. Patterson made use of actual sales experiences in compiling his manuals, let us examine this excerpt from the *Manual for N. C. R. Salesmen*:

"A successful agent tells of his experience when he started out on his first trip. He went to a city in which his predecessor had made good sales. After spending nearly a week without making a sale, he wired headquarters that he felt he needed further training.

"He received an encouraging reply with the advice, 'Go to the end of the street.' He had his samples all packed to go to the next town, but he took another look to see if he had called on every merchant. He had skipped a drug store and a fruit shop.

'He had not visited the fruit shop because he saw no fruit in the window. He thought if the storekeeper had no goods to display there would be no chance to sell him a register.

"He had not called on the drug store, because it did not have the usual store front, being located in an old-style, two-story building with only one window. He did not know that Mr. Brown was a druggist of reputation nor that he had been established for many years and was doing a thriving business.

"He approached the druggist who said, 'I have often considered buying a cash register, but the price is too high.' Upon being asked what register he had in mind, the druggist went to his desk and brought out a proposition which had been given him by the former salesman.

"After convincing the druggist that the price was right, the salesman secured his order for the register which had been previously demonstrated to him. With the slogan, 'Go to the end of the street,' in mind, the new salesman called on the fruit dealer and sold him a machine.

"Give everybody a chance to buy. Take it for granted that everyone can buy, rather than determining without an interview that some people will not buy. Let the merchant decide. Do not decide for him."

* * *

Approaching the Prospect

When Patterson got his "rookies" together for one of his schools, the first thing they were taught—after learning about the cash register itself—was how to approach a prospect. They were given best-by-test "approaches" to study and memorize, like this one:

"Mr. Blank, my name is Knox. I represent the National Cash Register Company" (wait a few seconds) "and I want to show you how a modern National Cash Register will increase your profits, stop losses in your store, and increase your business."

Later they progressed to a point where they could, in their own words, make a thoroughgoing approach such as this:

"Mr. Blank, I want to ask you a rather serious question. Do you feel you are getting all that you should out of this business? I mean, are you satisfied that you are getting the return that you are entitled to on the investment you have made here?

"I have no idea, of course, as to how much money you have put into the business, but I can see that you are carrying a large stock of goods, that you are conducting an up-to-date store, that you employ several clerks, and I presume you are putting in considerable of your time also.

"You say that you feel you are getting the amount of money you should out of the business. I would like to ask you, Mr. Blank, why you feel this way? Do you attribute it to your method of handling your business, or do you believe it is due to the carefulness and accuracy of your clerks?

"You say that you attribute it to both of these factors. I have called upon quite a number of merchants, but you are the first to put the matter up in just this way. I would appreciate it if you would show me how your system operates. An exchange of ideas might be helpful to both of us."

N.C.R. salesmen were taught not to discuss the superiority of the National cash register nor discuss any of its selling points until they had shown the prospect that they were vitally interested in the problems of *his* business.

Their cue was to talk in terms of the prospect's needs and interests, rather than in terms of the product. Sentences were to be opened with "you," rather than with "we," and all subsequent conversation was to follow that procedure.

Smashing Summer Records

(1) Henry Burritt, Kelvinator's dynamic vice president in charge of sales, hangs up his coat and hat and finds a sheaf of telegrams on his desk with news of oversold July and August quotas. (2) Commercial Salesmanager "Doc" Harlan looks proudly over the figures on summer sales of his big commercial refrigeration organization. Kelvinator enjoyed a surprisingly good business during the summer's tail-end.

THE NEWSPAPER OF THE INDUSTRY

ELECTRIC REFRIGERATION NEWS

WRITTEN TO BE READ ON ARRIVAL

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Baltimore Group Is Organized by Appliance Men

Major Appliance Dealers Organize to Promote Better Selling

BALTIMORE — Recognizing the need for better coordinated merchandising of major electrical appliances, including refrigerators, leading merchants and distributors of this city recently formed the Electrical Merchandising Association of Baltimore. This is the first organization of this type in the appliance merchandising field here.

All dealers of major electrical appliances in the metropolitan area of Baltimore are eligible to membership in the new association. Present officers of the organization are:

J. Jefferson Miller, merchandise manager of refrigeration for Hecht Bros. Co., president; H. C. Maccubbin, merchandise manager of the Baltimore branch of General Electric Supply Corp., vice president; Irving Robinson, executive in charge of refrigerator activities, Mayer's Department Store, treasurer; and C. F. Roycroft, secretary.

The board of directors comprises the following:

C. J. Zamoiski, president of Joseph M. Zamoiski Co., Norge distributor in this area; C. H. Buchwald, president of Lincoln Sales, Inc., Crosley distributor for the Baltimore-Washington area; Dorsey R. Smith, Consolidated Gas Electric & Power Co.; I. P. Hall, manager of refrigerator department, Hochschild, Kohn & Co., Inc., department store; William E. Johnson, president of Johnson Bros., refrigerator, air-conditioning, and radio dealer; H. A. Harrison Williams, refrigerator and electrical appliance dealer of Towson.

Barber-Colman Buys Uni-Flo Grille

ROCKFORD, Ill.—Barber-Colman Co. of this city, manufacturer of electrical apparatus and temperature controls, has acquired the Uni-Flo Grille Corp. of Detroit, manufacturer of grilles for air-conditioning work.

Production of the Uni-Flo grilles will be carried on at the Barber-Colman plant here, and sales activity will be directed from the main office, reports C. J. Braatz of Barber-Colman.

The present Uni-Flo sales organization, says Mr. Braatz, will in a large measure be kept intact, because in a number of territories the Barber-Colman representative and the Uni-Flo representative have been one and the same.

Mr. Braatz declares that it is Barber-Colman's plan to handle both grilles and control equipment through a common sales organization, since air distribution problems and problems involving automatic control are so closely related.

De Witt Manages New Refrigeration Division of Apex

W. M. DE WITT

CLEVELAND — W. M. De Witt, formerly of Kelvinator Corp., has assumed his new duties as manager of the new refrigeration sales division of Apex Rotarex Corp.

This is the first time Apex has separated the management of its refrigeration merchandising activities from those of its other electrical appliances, which include vacuum cleaners and laundry equipment.

Mr. De Witt will continue the Apex policy of selling directly to dealers. He will work under the direction of Charles W. Smith, new Apex sales manager, and report to R. J. Strittmatter, vice president in charge of sale.

Lord & Thomas Made Frigidaire Agency

DAYTON—Frigidaire Corp. has appointed Lord and Thomas to handle its advertising on refrigeration and air-conditioning products.

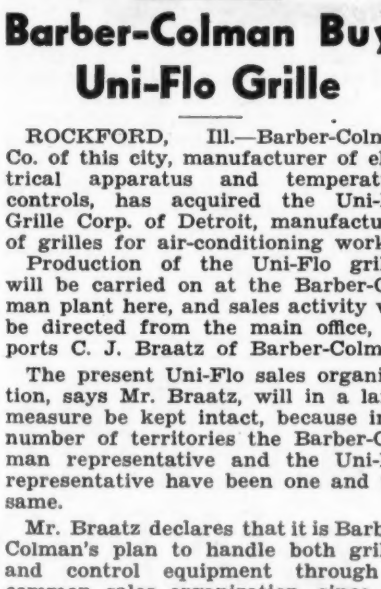
Lord and Thomas has offices in Chicago, New York City, San Francisco, and Los Angeles.

Curtis Named Factory Supt. of Brunner

UTICA, N. Y.—Charles L. Curtis has been appointed factory superintendent of the Brunner Mfg. Co. Previous to joining the organization Mr. Curtis had been connected with the Universal Cooler Corp., where he was successively service manager, factory foreman, factory superintendent of Plant No. 2, superintendent of the Canadian factory, and from 1932 until recently, general factory superintendent.

* * *

At the Banquet for Charley Curtis



F. S. McNeal, president of Universal Cooler Corp., relaxes from his duties at the banquet tendered by Universal Cooler executives for Charles L. Curtis (the gentleman on the right who is going places with an ear of corn), who left the Detroit firm after many years of service to join Brunner Mfg. Co. as factory superintendent.

Cincinnati and San Diego Sales Gain over 1934

August San Diego Total Sets Record; 7 Month Cincinnati Total Up

Reports on retail sales compiled by Cincinnati and San Diego cooperative associations last week showed that in these two areas distributors and dealers have smashed ahead to new heights in electric refrigerator selling.

For the first seven months of this year retail sales of household electric refrigerators in Cincinnati totaled 1,890 more units than were sold in the similar period in 1934, according to reports compiled by the Refrigeration Section of the Cincinnati Electrical Association. July sales drives by distributors and dealers helped to push 1935 sales past the '34 mark.

Feature of the summer refrigeration drive was a cooperative newspaper campaign in which the members of the association participated.

Sales of domestic electric refrigerators in San Diego County, Calif., during the month of August totaled 1,250 units—100 more than the previous all-time high record for any month established in July, and three times greater than the August, 1934, figure, J. C. Chamberlain, secretary-treasurer of the Bureau of Radio and Electrical Appliances here, reports.

For the first eight months of this year 5,000 sales were made, a thousand more than were ever made in this county during any one year.

Mr. Chamberlain reports that sales of electric ranges and automatic ironers nearly doubled last year's volume, and that radio sales indicate that total volume for this year will

(*Concluded on Page 2, Column 1*)

Crosley Designs New Unit with Large Ice Cube Capacity

New table-high Crosley FA-27, which makes 126 cubes per freezing, and is designed for use by those who have occasion to entertain frequently.

* * *

CINCINNATI—A new type of electric refrigerator, built especially for super-freezing, and designed for the home that does a great deal of entertaining and needs an abundant supply of ice cubes for cool drinks, has been announced by Crosley Radio Corp.

Its list price is $125, including delivery and installation, plus a year's free service.

The refrigerator may also be used in business offices, or in summer camps or hunting lodges where electricity is available. In large homes, it may be used as a second refriger-

(*Concluded on Page 2, Column 3*)

Rosen Formally Opens New Headquarters

PHILADELPHIA—Formal opening of the new quarters of Raymond Rosen & Co., Inc., distributor of RCA Victor radio products, Kelvinator refrigerators, and Prima washers, at 31st and Walnut Sts. here is being held this week.

Alltmont to Direct Range Activities For Kelvinator

S. V. ALLTMONT

DETROIT—Effective Oct. 1, S. V. Alltmont, manager of the liquid cooling department of Kelvinator Corp., will become manager of Kelvinator's newly formed electric range division, states H. W. Burritt, vice president in charge of sales.

For the past year, Mr. Burritt said, the company has been marketing the electric range through its own branches and a few of its distributors. The company feels it is now ready to launch an educational sales promotion and advertising program on a broader scope.

Mr. Alltmont has been in charge of Kelvinator's liquid cooling department for the past four years. Prior to joining Kelvinator Corp., he was general merchandise manager for a utility company with properties throughout the United States.

Detroit Contractor Gets San Antonio Postoffice Air-Conditioning Job

SAN ANTONIO, Tex.—Davis Bros., Inc., 2631 Bagley St., Detroit, has been awarded a government contract for the installation of a year-'round air-conditioning system in the new postoffice building here. The contract also includes the plumbing work for the building.

Work on installation of the system, which will be of 300 tons capacity, will probably be started some time in November. Type of system to be installed has not been decided, the Davis concern being allowed the option of submitting a system of its own design for approval by government engineers, in preference to the one now specified for the building.

Portions of the air-conditioning work, including the sheet metal work and some of the refrigerating equipment, will be sublet, it is understood.

A Detroit concern, A. W. Kutsche & Co., has the general contract for the building.

Jobbers of Parts To Assemble in Detroit Oct. 23

Dinner and Smoker to Be Given Visitors by Local Committee

DETROIT—The problems arising out of a new development in the refrigeration and air-conditioning industries—the business of jobbing parts, materials, and supplies—will be discussed at an informal dinner meeting and smoker to be held here on Wednesday, Oct. 23.

The dinner will be given by a local committee at the Hotel Wardell after which there will be a smoker at the new home of ELECTRIC REFRIGERATION NEWS, a block west of the hotel.

The local committee, representing manufacturers interested in developing the refrigeration and air-conditioning supply business through jobbers, consists of J. D. Colyer (chairman), Wolverine Tube Co.; Irving S. Knudson, Detroit Lubricator Co.; Morrill Dunn, McCord Radiator & Mfg. Co.; Frank Riley, Riley Engineering Co.; and F. M. Cockrell, publisher of ELECTRIC REFRIGERATION NEWS. Other interested manufacturers are being invited to cooperate.

The following invitation has been mailed out to refrigeration parts and supply jobbers:

Sept. 25, 1935.

To Refrigeration Supply Jobbers
Subject: Meeting in Detroit, Oct. 23.
Dear Sir:

You are cordially invited to attend a dinner meeting of refrigeration supply jobbers to be given at the Hotel Wardell, Woodward Ave. and Kirby St., Detroit, on Wednesday evening, Oct. 23, 1935. After the dinner

(*Concluded on Page 2, Column 2*)

Dry-Zero Insulation Used in 35% of Units Sold in Past 18 Mo.

CHICAGO—During 1934 and the first six months of 1935, Dry-Zero Corp shipped enough sets of refrigerator insulation to insulate 41 per cent of the 2,108,360 cabinets reported sold in that period by manufacturers who are members of the Household Refrigeration Section of the Refrigeration Division of Nema, reports Harvey B. Lindsay, Dry-Zero president.

"This does not mean that 41 per cent of all electric refrigerators are Dry-Zero insulated," points out Mr. Lindsay, "because the figures do not include cabinets sold by manufacturers not reporting to Nema. Dry-Zero probably was used in 35 per cent of all cabinets sold since January, 1935.

"The 18-month period was taken to compensate for the lag between insulation shipments and the sale of refrigerators."

Dry-Zero shipments this year have kept pace with the increased production of refrigerators, Mr. Lindsay says, but have registered no startling gains such as occured a year ago,

(*Concluded on Page 2, Column 1*)

This Issue—Featuring Valves & Fittings; Next Week—Condensing Units & Parts, Compressors, Refrigerants & Oils

In the spotlight in this week's issue of ELECTRIC REFRIGERATION NEWS are refrigeration valves and fittings. Articles dealing with the operation, adjustment, and testing of valves will be found starting on page 4.

The section dealing with fittings begins on page 8, the articles dealing with the development and construction of compressor valves and fittings for the refrigeration industry, and their function in the installation and operation of a refrigeration system.

The fact that the spotlight has been turned on valves and fittings does not mean that air conditioning, which is featured in the fourth issue of each month, has been neglected in the editorial content of this issue. Starting on page 14 and continuing through the next five pages will be found information on air conditioning.

Next week's issue of ELECTRIC REFRIGERATION NEWS will feature condensing units, compressor parts, condensers, refrigerants, and compressor oils, with emphasis in the editorial articles on the proper operation, care, and service problems of these parts.

Editorial attention will be focused on motors and controls for refrigeration and air-conditioning applications in the Oct. 9 issue.

The Oct. 16 issue will deal with refrigerator cabinets, and such cabinet components and parts as finishes, insulation, gaskets, breaker strips, shelves, and nameplates.

Service and installation tools designed to enable the service man to do a better job will be treated in the Oct. 23 issue.

The Oct. 30 issue will feature evaporators for both household and commercial applications, and will also spotlight ice cube trays.

"What's Inside" the refrigerator could well be the title for the Nov. 6 issue, which will center attention on refrigerator accessories.

Retail Sales Make Gains in San Diego And Cincinnati

(*Concluded from Page 1, Column 3*)

exceed 12,000 as against 10,000 units sold last year. He also states that 320 electric heaters have been sold in this eight-month period, and in 1934 only seven heater sales were made.

The increasing importance of "unconventional outlets" handling electrical appliances in this territory, was a feature of the current season, Mr. Chamberlain says. Included among these "new dealers" are automotive concerns, lumber and building material outfits, and a leading jewelry store.

This bureau recently held a 35th Anniversary banquet, features of which were a 20-minute skit depicting selling conditions in the early 90's, and a review of bureau events during the last two years, in which it was revealed that this outlet had run 18 separate advertising and promotional campaigns for all appliances.

What was claimed to be California's most novel talk "on record," was the speech made by "Frosty" Raymond, in which his recorded voice, issuing from a phonograph, interrupted his speech with contradictions and admonitions, until he let the record deliver the message for him.

Promotional plans for this fall include an intensified radio program, a Better Vision campaign in which electric appliances will be pushed, and a Christmas sales drive.

Dry-Zero Insulation Used in 35% of Units Sold in Past 18 Mo.

(*Concluded from Page 1, Column 5*)

when shipments were two and one-half times those in 1933.

The company anticipates a considerable increase next year, he states, in the belief that the upward trend of electric refrigerator sales will continue as general business conditions improve. The fact that this year's sales have held up well during the later months of summer is considered a good sign, declares Mr. Lindsay.

In the refrigerated truck field, shipments of Dry-Zero blanket and Sealpad are far above last year, Mr. Lindsay reports. During the first six months of 1935, shipments of these products were 23 per cent greater than during the first half of 1934.

This indicates a steady increase in the use of refrigerated trucks, since Dry-Zero supplies the bulk of the insulation in this field, he said.

C.I.T. Contracts to Finance Stromberg Carlson Sales

ROCHESTER, N. Y.—Commercial Investment Trust, Inc., has signed an exclusive contract with Stromberg Carlson Telephone Mfg. Co. here, to act as official financing organization for Stromberg Carlson radio dealers and distributors throughout the country.

Other similar arrangements recently completed by C.I.T. are those with the RCA-Victor Division of the Radio Corp. of America, and the Atwater Kent Mfg. Co.

Sales Contests & How to Run Them

NO. 8—'KEENO' GAME PLAYED ON BASIS OF SALES MADE PROVES STIMULATING IF PRIZES ARE SUBSTANTIAL

By John Kumler, Sales Contest Manager
Buckley, Dement & Co., Chicago

Make up a number of cards or sheets of paper five squares by five squares (25 numbers). Get (or make) a paddle wheel with 100 numbers.

From a list of 100 numbers, begin to write them in ink on salesmen's cards—one number in a square (picked at random) for every $25 or $50 of sales. Thus a man may win one, more than one, or an incomplete card by the end of the contest.

Vary the numbers picked for the men so that the cards are as different as possible.

At the close of the contest spin your wheel, allowing those who have the numbers that come up to check them off (keeping a record of the numbers you spin so you can check up the claims of the winners).

Spin until one or more contestants have completed five numbers in a straight line (five horizontal, five vertical, five diagonal).

They get the prizes: A fiver or a sawbuck would make 'em feel pretty good. In this plan, all who have five or more numbers have a chance. A full card (25 numbers earned) of course provides the most chances.

Parts Jobbers Meet In Detroit Oct. 23

(*Concluded from Page 1, Column 5*)

there will be an informal smoker at the new home of ELECTRIC REFRIGERATION NEWS, located just a block west of the hotel.

The dinner meeting will be sponsored by a committee of Detroit manufacturers interested in the development of the refrigeration and air-conditioning parts and supply business through jobbers. This committee consists of J. D. Colyer of Wolverine Tube Co., Irving Knudson of Detroit Lubricator Co., Morrill Dunn of McCord Radiator & Mfg. Co., Frank B. Riley of Riley Engineering Corp., and F. M. Cockrell, publisher of ELECTRIC REFRIGERATION NEWS. Representatives of other manufacturers of parts, materials, and supplies will also be invited to attend.

An opportunity will be provided at the meeting for the jobbers and manufacturers to discuss problems of mutual interest, particularly such matters as the establishment of standards of practice which may be set up as a guide for the development of the new supply branch of the refrigeration industry.

The above date was selected because a number of leading jobbers have already indicated their intention to be in Detroit at that time on account of the convention of the Refrigeration Service Engineers Society to be held Oct. 23, 24, and 25.

In order that proper arrangements may be made for your entertainment, we will appreciate it if you will let us know as soon as possible if we may count on the presence of one or more members of your organization at this gathering.

Entertainment Committee,
J. D. COLYER, Chairman
IRVING KNUDSON
MORRILL DUNN
FRANK B. RILEY
F. M. COCKRELL

There has been considerable discussion recently regarding the need for an association of refrigeration supply jobbers and leadership of the movement has already been proposed by H. T. McDermott, secretary of the independent service men's society and by a Mr. Goldberg of Chicago.

West Coast Dealer Moves

SAN FRANCISCO—New location of Moore & O'Neil, Kelvinator and Apex refrigerator dealer, is 2122 Shattuck Ave. in Berkeley, Calif.

Crosley Designs New Unit with Large Ice Cube Capacity

(*Concluded from Page 1, Column 3*)

ator, to be placed in the entertainment room or pantry.

Compact and table-high, the "Super Freezer," model FA-27 in the Crosley line, is provided with six ice cube trays, with a capacity of 126 ice cubes per freezing.

When set at the coldest point, the unit will freeze fish, fowl, and meat, and preserve them for long periods; at the warmest point, everything in the refrigerator will be preserved, but not frozen.

The refrigerator has a net capacity of 2.7 cu. ft., and a shelf area of 5.3 sq. ft. The six ice cube trays will make 126 cubes, or about 10.4 lbs. of ice, at a single freezing. Insulation is 2 in. at top, 2½ in. at sides, 2¾ in. at the bottom, and 3¼ in. at the door.

Hardware is of stamped brass, chromium plated. Interior finish is in porcelain, and exterior of white lacquer, with black trimmings. Temperature control is included, and the unit is self-contained and removable. The refrigerator is 36 in. high, 23½ in. wide, and 25 in. deep.

Harry Alter Trailer Has 'Observation Platform'

CHICAGO—The Harry Alter Co. is using a unique car and trailer combination to advertise and promote interest in Grunow radios and electric refrigerators in Chicago and northern Illinois cities. Feature of the trailer construction is a canopied "observation" platform on the rear.

Intended primarily for use in lining up dealers, the display may also be used to promote retail sales, even to the point of making home demonstrations for individual dealers.

For the next several months, the display will be fitted up with the new Grunow radio line. In the spring, the 1936 Grunow electric refrigerators will be featured.

As an aid in signing up Grunow radio dealers, the trailer is parked in front of a prospective dealer's store, an a.c. cable is run into the store, and all sets in the line are demonstrated.

The trailer is painted white, as is the car which tows it. It is 19 ft. long, 4 ft. wide, and accommodates 17 radios.

Greusel Urges Wisconsin Utilities to Teach Dealers Sound Business Practice As Way to Greater Profits

MILWAUKEE—Utilities can do a great deal to improve the household electric refrigeration situation in Wisconsin by showing small dealers the way to greater profits through better business methods, Frank W. Greusel, president of the Wisconsin Radio, Refrigeration, and Appliance Association, told members of the Wisconsin Utilities Association during their convention here last week.

Responsibility of the public utility in this educational work is even greater than that of the manufacturer and distributor, Mr. Greusel said.

"Retailers in the smaller communities throughout the state," the speaker said, "have in many instances advanced from rather modest circumstances, and probably with a background of mechanical training, rather than commercial.

"Such dealers naturally have to learn their lessons by experience, which is sometimes bitter and ruthless, as the mortality rate, according to commercial rating agencies, will prove.

Meet Unsound Price Situations

"Unfortunately, while these new dealers are learning their A B C's in such business details as overheard, gross income, and net profits, they more or less set the pace for existing dealers—who are sometimes too inclined, in an effort to protect their market position, to meet unsound price situations.

"In prosperous times, when there is sufficient patronage for all, this condition is not always serious. But during the past few years, many markets have been badly demoralized because of this weakness in retail organizations.

"Many dealers, because of ignorance, are justifying unsound transactions because of competition from the commercial departments of public utilities. In some cases, the dealers have had good reasons for violating business ethics. But this situation is entirely unnecessary, as was definitely proven recently.

"In the town of which I speak, dealer relations with the public utility were badly strained. Friction, jealousies, discord, and misunderstanding were so prevalent that the sales of all household electrical appliances was almost at a standstill.

"In this same community, only recently, a joint sales campaign was conducted, supported and financed by manufacturers, distributors, and utility, and cooperated in by department and chain stores, downtown and neighborhood appliance dealers. These men met frequently, dined together weekly, during the drive.

"The members of the trade in this town now have a better and broader understanding of what it's all about than they ever had previously.

"Here is just one example of leadership on the part of the utility which definitely proves the importance of the part played by the commercial departments of central stations."

Manufacturers and distributors, Mr. Greusel said, can assist in improving the dealer's lot by showing him that cutting prices to make sales is not a sound business practice.

"The level of business conduct, on the part of small retailers, has made greater headway toward stabilization and proper management during the last few months than has prevailed for many months previously," he added.

"Continued efforts on the part of commercial departments of utilities, the constant cooperation of manufacturers and distributors, the influence of trade associations and electrical leagues, and the group or sectional organizations of dealers, all will tend to promote a better understanding and confidence, which, improved with time, will strengthen dealers to greater tolerance, so that the evil influence of suspicious misunderstandings will not lead them to continue the ruinous practices of unprofitable competition.

Every Transaction Profitable

Dealers must be taught that each transaction must be profitable—that loss leaders, aside from being unprofitable, have a bad reaction on the purchaser. They must be made to realize that certain irreducible items of overhead expense, which, based upon their sales volume, possibly places their operating ratio in direct line with other retailers, the department stores, and the power company.

"If a dealer can be made to realize his exact cost of doing business, it should then be merely a mathematical calculation to determine how far he can go in meeting a price situation.

"One of the biggest problems to overcome, with most dealers, is the knowledge they have of the traffic which is enjoyed by department stores and electric power companies, as compared to his own rather limited traffic.

"I know of several dealers who successfully meet this situation by offering a personal service which is difficult for the larger units to render—and I have known of dealers collecting a premium for this service.

"However, this type of dealer is admittedly in the minority, but the industry should accept the challenge to attempt by education, training, and leadership to improve those who lack this knowledge of merchandising ability."

Pointing to the radio industry as one which, plagued with price-cutting and over-production in its early days, was brought back to business health by intelligent leadership and proper merchandising methods, Mr. Greusel concluded:

"I cannot imagine the leaders of the refrigeration industry allowing their products to be debauched as was radio, but only by the combined efforts of all identified with the industry can it be maintained on a basis which will attract the most intelligent merchandising talent."

Data on Operating Costs of Kerosene Units Is Collected

FARGO, N. D.—Data on the food-preserving properties and operating costs of kerosene-burning household electric refrigerators are being recorded in tests now in process at the North Dakota Agricultural College experiment station here under the direction of H. F. McColly, agricultural engineer.

The studies are being conducted on refrigerators which operate without electricity for farm homes, because rural electrification is not developed to a high degree in North Dakota, Mr. McColly declares.

While the studies are not yet far enough advanced for a detailed report, the following data has been secured on a kerosene-burning refrigerator of the daily generating type:

Operating Data

Average amount of kerosene per week—6 quarts.

Average regenerating time for 1 quart of kerosene—2 hours.

Rise in air temperature 2 feet from refrigerator during generation—4° C.

Rise in air temperature 10 feet from refrigerator during generation—2.6° C.

Average time for mechanical servicing (refueling, etc.)—5 minutes per day.

Maximum temperature of refrigerator after generation—40° F.

Time required to reach maximum temperature—3 hours.

Minimum temperature after generation—27° F.

Time required to reach minimum temperature—18 5/9 hours.

Number of times refrigerator opened each day—6.

Food Keeping Efficiency

Fruits and vegetables kept as long as 6 weeks.

Meats in a hydrator kept in very good shape for 8 days and lost only 4.3 per cent weight.

Milk, cream, and butter kept very well, but butter would absorb kerosene odor if refrigerator was opened during generation.

Frozen desserts and ice creams were easily made, and were very good.

Sherbets would melt during generation, as the freezing unit defrosts during every generation.

Beecher-Cumming to Sell 'Super-Cold' Line

MINNEAPOLIS—Beecher-Cumming, Inc., has been appointed Minnesota distributor for the Super-Cold commercial refrigeration equipment, manufactured by the Commercial Refrigerator Mfg. Co., Los Angeles, reports M. M. Rudoy, northwest representative for the factory.

Included in the line of equipment to be handled are meat and delicatessen cases, walk-in coolers, Westinghouse compressors, restaurant and grocery refrigerators, ice cream counter freezers, ice cream dispensing cabinets and coils complete, and other refrigeration equipment for commercial applications.

Gilmore Will Head G-E Educational Program

BRIDGEPORT, Conn.—L. G. Gilmore has been appointed supervisor of the new G-E educational program being conducted by the General Electric Co.'s merchandise department.

This course covers educational principles on commercial lines, and fundamental courses in accounting and manufacturing. Opening the program, a series of business training classes, in charge of instructors selected largely from within the organization, will start early in October. Applicants must have a high school education, or its equivalent.

Mr. Gilmore graduated from Princeton, and served as instructor in the Harvard School, Los Angeles, for two years. He worked one year for the Republic Supply Co., and later joined the Maqua Co., Schenectady. He became a member of the G-E organization in 1929.

Akron Hardware & Supply Entertains Dealers

AKRON, Ohio—Complete line of Crosley 1936 radios, current advertising exhibits, Shelvador refrigerators, G-E Hotpoint appliances, and other products sold by the Hardware & Supply Co., here, were shown to dealers at a meeting and merchandise display held Sept. 11, at the Mayflower hotel.

Howard E. Richardson, general sales manager of Crosley Radio Corp., addressed dealers on Crosley merchandise and selling plans.

Following the afternoon session, dinner was served in the ball room adjoining the display. After-dinner speakers were J. Edward Good, president of the Hardware & Supply Co., and Mr. Richardson, who went through a model sales talk.

VALVES

Data on Pressure Drop Through Various Types of Valves

By Joe Askin, Chief Engineer, Fedders Mfg. Co.

MULTIPLE installation of commercial refrigeration equipment is apparently increasing in extent. Service and installation men are becoming more critical and are making a carefull checkup of the refrigeration load of the system. As an aid to this checkup the refrigeration man requires information as to the pressure drop across any special valves used for the installation, such as the two temperature snap action valve, constant pressure valve, and check valve.

Figure 1 shows the two-temperature snap-action valve in an open position and the direction of flow of refrigerant vapor through the valve.

The table below gives the pressure drop through this valve for any capacity of the evaporator or low-side, expressed in B.T.U. per hr. Valves with both ½ in. and ⅝ in. S.A.E. connections are given.

This type of valve opens and closes with a snap action and has just one open position of the needle.

Figure 2 shows a constant pressure valve (CP-35) and the direction of flow of refrigerant vapor. The latter differs from the snap-action in that the needle is almost in a closed position at all times, opening up slightly when the pressure in the lowside exceeds the predetermined pressure for which the valve is set.

Actually the refrigerant vapor is bleeding past the needle at all times. To obtain the pressure drop through a constant pressure valve, which inherently is a "pressure drop" valve, is misleading unless the position of the adjusting tee-handle is given.

The table below gives the pressure drop through the valve for any given capacity of the evaporator when the tee-handle *was all the way out*, that is, the valve was opened wide to obtain the greatest capacity and with the *least* pressure drop. Any other position of the tee-handle will result in *less* capacity and *greater* pressure drop.

It may be observed from the table that the constant pressure is a high resistance valve and the snap-action is a low resistance valve; the conclusion is that if the capacity of the lowside is *great* and the allowable friction loss must be kept down, use the snap-action valve; otherwise use the constant pressure valve.

An initial pressure drop exists in a check valve due primarily to the use of an extremely light spring which keeps the valve in a closed (checked) position when the pressure difference between both sides of the valve is low.

The table below shows the pressure drop across the valve vs. B.T.U. per hr. It may be observed that the check valve with ⅝ S.A.E. male flare connections has very low pressure drop and should be used irrespective of the size of connection if the evaporator capacity is great, or if very little allowance has been made for the pressure drop across the valve.

Figure 1

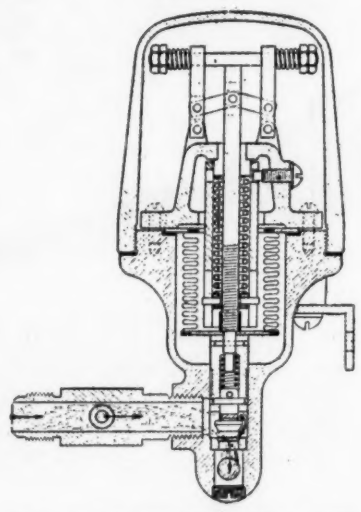


Fig. 1—Two-temperature snap-action valve in open position.

Figure 2

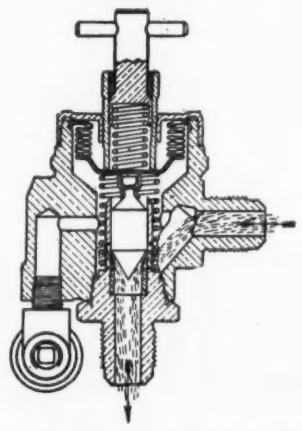


Fig. 2—Constant pressure valve.

Valve Adjustment

To set a constant pressure valve (shown in Figure 3), place the gauge on the valve provided for this purpose. To *raise* the pressure in the evaporator, turn the adjusting thumb nut "A" in a clockwise direction. To lower the pressure, turn in a counter clockwise direction.

It will take a short while for the condition in evaporator to stabilize.

Figure 3

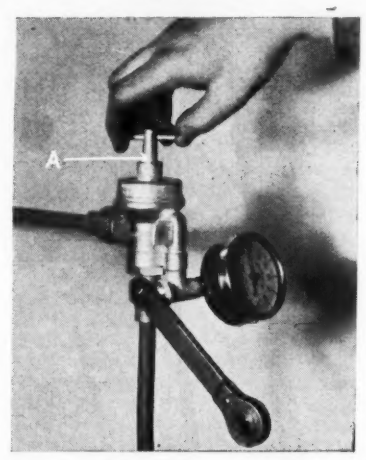


Fig. 3—Method of adjusting constant pressure valve.

Figure 4

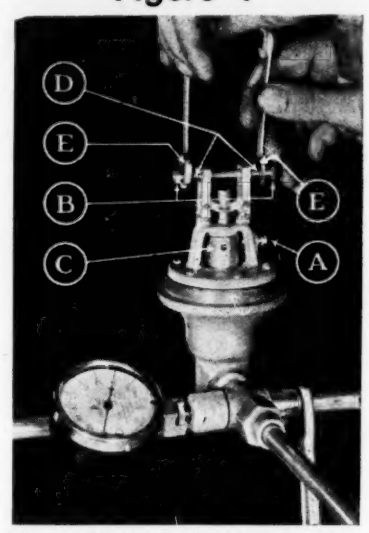


Fig. 4—Method of adjusting two-temperature snap-action valve.

To set a two-temperature snap-action valve (shown in Figure 4), remove moulded cover, place gauge on valve provided for this purpose, loosen the lock screw "A" and the outer hexagon head nuts "B."

Turn the adjusting collar "C" counter-clockwise if it is desired to raise the pressure. Turn clockwise to lower the pressure.

To *increase* pressure differential between "snap in" and "snap out" positions, tighten springs "D" by turning nuts "E" in *clockwise* direction. Turn opposite to decrease differential. It will take a short while for the condition in the evaporator to stabilize.

Tighten lock screw "A" and outer hexagon head lock nuts "B."

Pressure Drop Through Valves of Various Capacities

Type of Valve	Capacity—B.t.u. per Hour 750	1500	3000	6000	9000	12000	18000
REFRIGERANT—FREON							
Snap action valve with ½ in. S.A.E. male flare connections	...	...	1.2	1.9	2.5	3.2	4.6
Snap action valve with ⅝ in. S.A.E. male flare connections	...	...	1.0	1.7	2.2	3.0	4.3
Constant pressure valve with ½ in. S.A.E. male flare connections	...	...	1.0	1.6	3.0	8.5	...
Check valve with ½ in. S.A.E. male flare connections	0.8	1.1	1.8	3.5	...	...	...
Check valve with ⅝ in. S.A.E. male flare connections	...	...	0.3	0.7	1.0	1.4	1.8
REFRIGERANT—METHYL CHLORIDE							
Snap action valve with ½ in. S.A.E. male flare connections	...	...	0.2	0.8	1.4	2.0	3.3
Snap action valve with ⅝ in. S.A.E. male flare connections	...	...	0.2	0.7	1.2	1.8	3.0
Constant pressure valve with ½ in. S.A.E. male flare connections	...	...	0.8	1.2	2.0	4.8	...
Check valve with ½ in. S.A.E. male flare connections	0.6	0.7	0.9	1.5	2.3	3.3	...
Check valve with ⅝ in. S.A.E. male flare connections	...	...	0.1	0.4	0.6	0.9	1.4

Imperial Brass Engineers Tell Why Valves & Fittings Must Offer Resistance to Wear

CHICAGO—Use of very penetrating agents in refrigeration systems has created severe tests for the metals of which the valves and other parts are made; and hence one of the first requirements in the design of modern refrigeration systems is seepage-proof construction, declare engineers of the Imperial Brass Mfg. Co.

If metals are used that are not absolutely non-porous trouble will inevitably develop, these men state.

Forgings, made from extruded brass, present an impassable wall to all known refrigerants, claim the engineers. All valves should be brass forgings, also the nuts, tees, elbows, and crosses, they say; connectors, unions, etc., may be made from an extra heavy extruded bar stock.

Valves used in refrigeration systems must be able to offer tough resistance to the wear they receive. Imperial Brass engineers state that in official trials which they conducted the sylphons used in their valves withstood more than 100,000 cycles of oscillation without a failure, a more severe test than would probably be applied in working conditions.

Ability to stand wear is also of importance in appurtenances to refrigeration equipment such as the Imperial charging and testing unit, where the two valves controlling the various lines require frequent opening and closing.

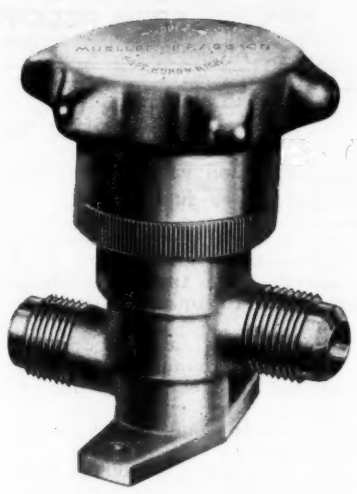
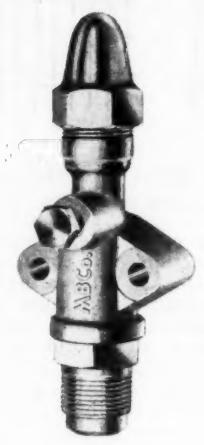
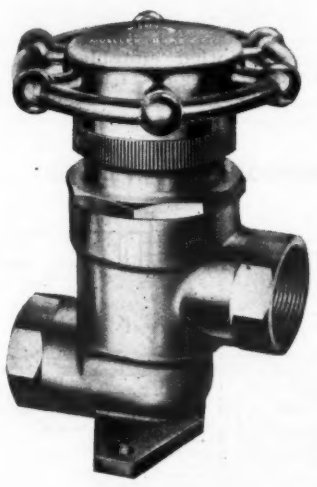
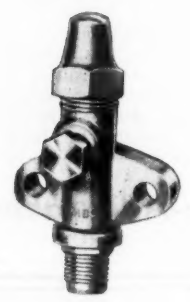
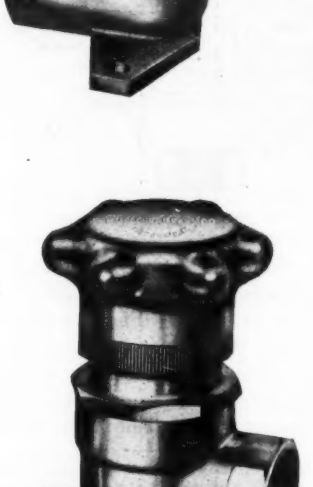
In construction work, the type of valve specified often determines in a great degree the kind of service given, so Imperial's lines include both the cap and wheel-handle types of packed valves, latter being the back-seated variety. There are also compressor valves in cap and open stem types, with the back-seating feature.

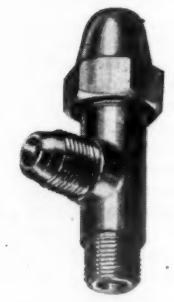
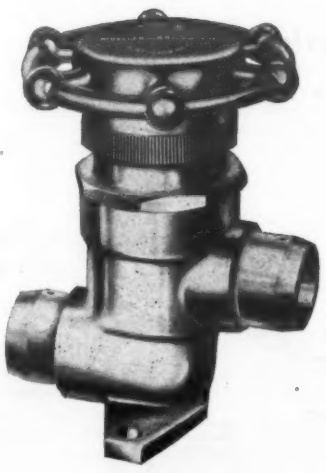
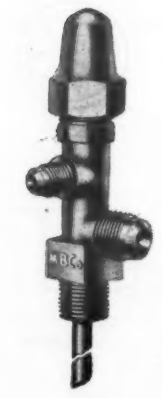
Combination Valve Used To Regulate Water in Refrigeration Jobs

CLEVELAND—Milton Bernstein, general manager of the Central Brass Mfg. Co. here, declares that most of his company's customers for water regulator devices to be used with refrigeration equipment have found it expedient to install a self-closing valve with a stream control valve, rather than a combination of the two.

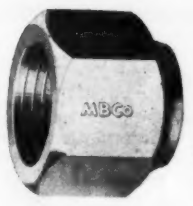
Central's stream control valve makes the water stream constant regardless of varying pressure in the supply line, and it is not a pressure reducing valve but a position control valve, says Mr. Bernstein.

The Best Materials — The Most Expert Workmanship — The Most Complete Line

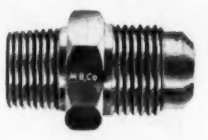





It is of the utmost importance that valves and fittings for mechanical refrigeration be manufactured of the very best materials procurable for the purpose. The Mueller Brass Co. uses brass forgings which have a tensile strength of approximately 55,000 to 60,000 lbs. per square inch for all valve bodies, flared tees, elbows, etc. Specially treated drawn brass rod having a tensile strength of 60,000 to 65,000 lbs. per square inch is used for integral parts of valves, flared couplings, fitting caps, etc.



Valve stems are supplied from Tuf-Stuf, a non-corrosive alloy having a tensile strength of 90,000 lbs. per square inch or from steel, cadmium plated, which has a tensile strength of approximately 70,000 lbs. per square inch.

The packing used has been selected after extensive tests in our laboratory and is of a type that will not deteriorate in contact with refrigerants and oils and will not adhere to the stem after continued service. It requires very infrequent gland adjustment after dehydration and will continue to seal even after an unusual amount of operation.



All valves and fittings are machined to the standard of the Refrigeration Valve and Fittings Manufacturers Association. The openings are machined to permit a flow equal to the inside diameter of the tubing used. The threads are sharp and uniform and, in the shipment of valves, are protected by internally seated brass caps. Fitting threads are protected by heavy cardboard ferrules.

Special valves and fittings are made up to suit the customers' requirments and quotations are submitted promptly upon receipt of samples or blueprints.

Packless Valves

Our new line of packless valves are of exceptionally sturdy construction and are manufactured from the best of materials, as described above. The mounting plate on these valves is integral with the body. The bellows used in their construction have a factor of safety much in excess of anything required in actual service, but in case of possible rupture, may be readily replaced under pressure. This line of valves incorporates the back-seating feature.

SEND FOR OUR NEW CATALOG R-3

We have just published our new Catalog R-3 on Valves and Fittings for Mechanical Refrigeration and Air Conditioning, which shows a complete line of valves and fittings. All illustrations are shown with both external and sectional views with complete dimensional tables. We believe it to be the most complete catalog on mechanical refrigeration that it is possible to obtain. Send for your copy now.

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A. V. Huntley, Jr.....1255 Little Bldg., 80 Boylston St.
BUFFALO, N. Y.
The J. M. & L. A. Osborn Company....64-86 Rapin St.
CHICAGO, ILLINOIS
Steel Sales Corporation.....129 South Jefferson St.
CINCINNATI, OHIO
H. L. Hill.....Box 6, Station O
CLEVELAND, OHIO
Mueller Brass Co. (W. C. Young).....4500 Euclid Ave.
DALLAS, TEXAS
C. E. Grant.....1400 Allen Bldg.
DAYTON, OHIO
Mueller Brass Co.....407 Dayton Industries Bldg.
DENVER, COLORADO
A. B. Crosby.....1131 Columbine St.
DETROIT, MICHIGAN
Hunter-Wilkie Co.....2842 West Grand Blvd.
FLANDREAU, S. DAKOTA
W. B. Campbell.....214 E. Pipestone Ave.
FLINT, MICHIGAN
George A. Reamer.....20 Dort Bldg.
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P. H. Berry.....(P. O. Box 895) 305 Foster St.
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R. W. Young.....Apt. 602, 708 West 47th St.
LOS ANGELES, CALIFORNIA
Norman S. Wright & Co.....923 East Third St.
MILWAUKEE, WISCONSIN
Steel Sales Corporation.....647 West Virginia St.
MINNEAPOLIS, MINNESOTA
Steel Sales Corporation.....529 South Seventh St.
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Mueller Brass Co. (A. P. Relken), 271-277 Badger Ave.
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H. L. Hess Co.....Drexel Bldg., 5th & Chestnut Sts.
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Wm. M. Orr Company.....1228-30 Brighton Road
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Norman S. Wright & Co.....608 Pioneer Bldg.
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Steel Sales Corporation.....4903 Delmar Blvd.
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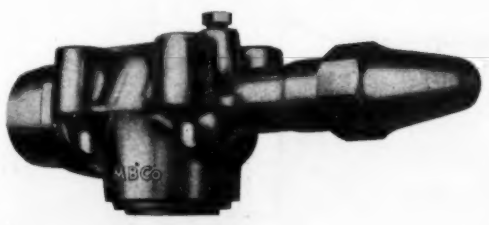
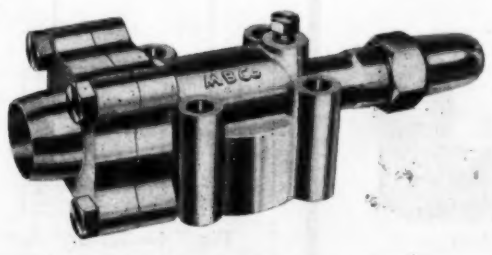
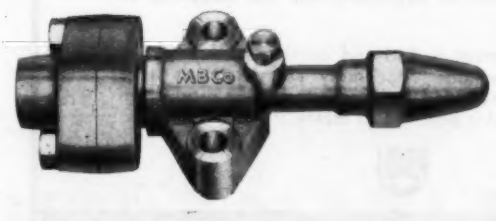
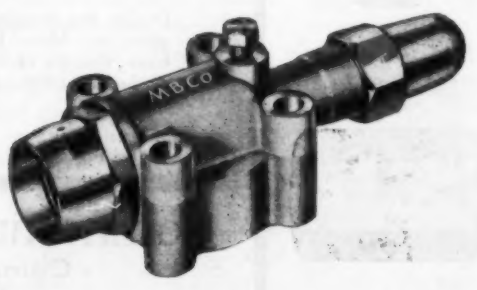
E. E. Sutter.....6705—6th St. N. W.

Mueller Brass Co.

PORT HURON, MICHIGAN

VALVES

Methods of Adjusting & Testing Thermostatic Expansion Valves

By D. D. Wile, Detroit, Lubricator Co.

THE following explanation of the thermostatic expansion valve describes its operation in simple terms. It is based on the fact that the body bellows opens and closes the needle, while the thermostatic power element controls the amount that the needle moves from the orifice.

How It Works

The bellows "H" (Fig. 1) responds to pressure in the cooling unit and tends to open the needle when the pressure decreases, close it on increase. Thus when the compressor starts up and reduces the pressure, the valve opens, while the increase in pressure after the compressor stops closes the valve.

The thermostatic element consists of the bellows "D" connected to the bulb "K." It is charged with a thermostatic fluid so that the pressure on the bellows depends on the temperature of the bulb. This bellows presses against the rigid push rod "T" and causes the needle to open more or less in accordance with the bulb temperature.

When the bulb is attached to the suction line as shown in Fig. 2 it controls the amount of needle opening in accordance with the suction line temperature.

If too much refrigerant is in the evaporator the suction line becomes too cold and the bulb then transmits less pressure to the bellows so that the needle moves closer to its seat and admits less refrigerant to the cooling unit. If there is too little refrigerant in the coil the suction line becomes warm, with the result that the bellows "D" makes the needle open wider and admit more refrigerant.

It will be seen that the thermostatic expansion valve controls the amount of refrigerant in the coil. When properly installed the *valve keeps the coil completely refrigerated* from beginning to end.

When the compressor stops, the valve closes due to the increase in pressure on bellows "H." It should remain closed throughout the shut down period.

Adjustment

The adjusting nut "A" presses on the head of the bellows and when this nut is screwed inwardly it opens the needle wider and admits more refrigerant. Turning the adjusting nut outward closes the needle and tends to starve the coil.

The valve shown in Fig. 1 is adjusted at the factory to a setting that will suit the average installation. Many years experience have shown that the factory adjustment seldom needs changing. A wide range of adjustment is provided, however, and the valve can be adjusted to flood or starve the coil.

The valve shown in Fig 3 is non-adjustable. This valve after being adjusted at the factory is completely sealed. It has had wide use on factory assembled units where the installations are of a uniform nature.

How to Test Thermostatic Expansion Valve

It is often desirable to test the thermostatic expansion valve for faults that might interfere with its operation. Also a test of this nature provides a check on valves removed from systems where the trouble was from another cause than the valve.

In making this test no special equipment is needed. Every service kit contains the necessary equipment except for a container full of crushed ice.

1. As shown in Fig. 4, connect the inlet of the valve to a service drum containing Freon or methyl chloride. (If clean dry air is available at 75 to 150 lbs. pressure it can be used in place of the service drum.)

2. To the outlet of the valve connect a low pressure service gauge, leaving the connection slightly loose to allow a slow leak of gas.

3. Insert the bulb in crushed ice and open the valve on the service drum. If the valve is properly adjusted the gauge should read:

3 lbs. for SO_2 valves
15 lbs. for methyl chloride valves
22 lbs. for Freon valves.

These pressures are equivalent to 22° F., and since the bulb is set at 32° F. it will be seen that the valve is adjusted to maintain the suction line 10° F. warmer than the refrigerant in the cooling unit. The suction line would then have 10 degrees "superheat."

Be sure that the thermos bottle or container is full of finely crushed ice. It is not satisfactory to use the container full of water with ice floating on top. In order to obtain 32° the container must be full of crushed ice.

4. If necessary to adjust the valve to the proper pressure. Next screw the gauge connection up tight to check for needle leaks. With a leaking needle, the pressure will build up rapidly on the gauge. With a tight needle, the pressure may build up a few pounds but will then hold steady.

5. Now test for loss of charge in the power element. Warm the bulb in the hand or insert in water at room temperature. The pressure should now increase rapidly on the gauge. If it does not the power element has lost its charge. Many valves are now being furnished with gas charged power elements.

If the power element is charged with gas be sure to note the maximum operating pressure. This is marked on the power element. The valve will not build up a pressure above this point regardless of how much the bulb is warmed up. This is one of the features of the gas charged power element. The valve will not open until the pressure is reduced below the specified maximum point.

6. Test for smoothness of action. With the gauge connection loose so as to permit leakage, cool the bulb and warm it up several times and watch the gauge to see that the pressure changes smoothly. If the gauge jerks badly the valve is probably sticking.

7. Inspect the inside of the bakelite. To do this it is necessary to have two strap wrenches, one to hold the bakelite from turning, while the other is used to unscrew the power element.

Then use a ¼-in. hex socket wrench to remove the screw in the end of the tension spring. After removing the spring use the strap wrench to remove the bakelite from the body.

8. It is now possible to test for bellows leaks by applying pressure to the outlet connection of the body with the inlet capped off and the valve submerged under kerosene or light oil.

9. Before assembling be sure to thoroughly dry all parts. Use white lead or other suitable thread "dope" on the threads at both ends of the bakelite. Assemble bakelite first, then the spring. It will be necessary to push on the handle of the socket wrench while at the same time turning it in order to stretch the spring into place.

Drop the push rod into the spring and then be sure that the four-pronged spring clip fits properly over the end of the push rod. This clip should exert a drag of about one-half pound.

Next screw the power element up tight, and adjust the valve as described under 1, 2, and 3 above.

Diagram of Valve Hook-Up

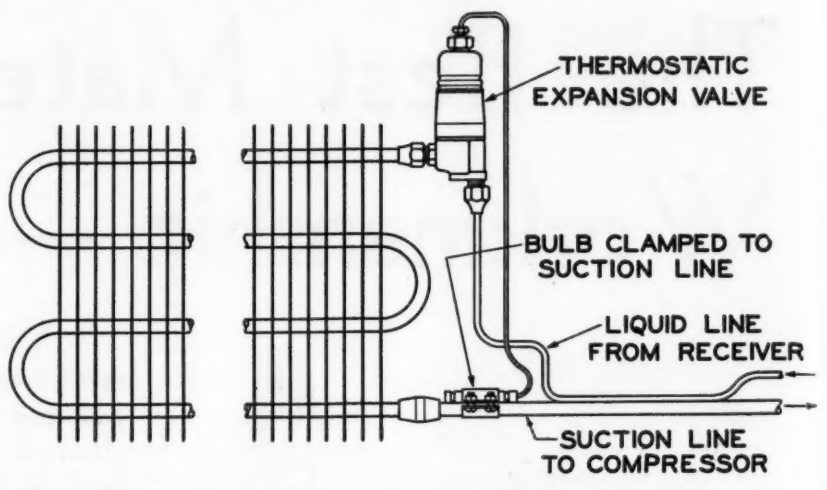


Fig. 2—Sketch shows how thermostatic expansion valve is connected to liquid line and how bulb is clamped to suction line.

Adjustable Thermostatic Expansion Valve

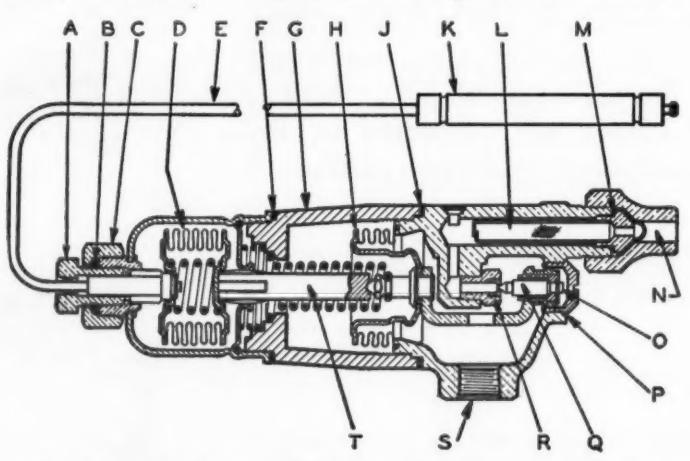


Fig. 1—Detroit Lubricator adjustable thermostatic expansion valve. Parts of the valve are designated by letters as follows: (A) adjusting screw; (B) packing around adjusting screw; (C) packing nut; (D) thermostatic power element; (E) flexible capillary tube; (F) moisture-tight joint; (G) bakelite extension; (H) bellows seal; (J) moisture-tight joint; (K) thermostatic bulb; (L) strainer screen; (M) copper gasket; (N) inlet connection for ¼-inch copper tube; (O) needle swivel; (P) solder-sealed plug; (Q) stainless steel needle; (R) stainless steel seat; (S) outlet connection; (T) bakelite push-rod.

Non-Adjustable Thermostatic Valve

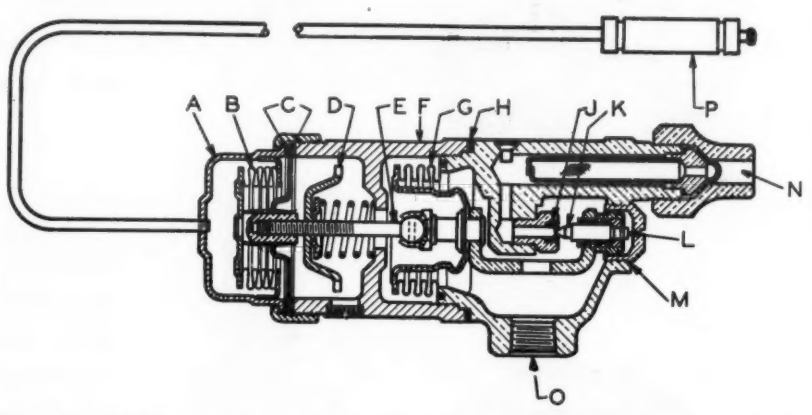


Fig. 3—Showing parts of the new Genuine Detroit non-adjustable thermostatic expansion valve: (A) Thermostatic power element, (B) Thermostatic bellows, (C) Moisture tight joint, (D) Factory adjustment, (E) Push rod, (F) Bakelite extension, (G) Pressure bellows, (H) Moisture tight joint, (J) Stainless steel seat, (K) Stainless steel needle, (L) Needle swivel, (M) Plug sealed metal to metal and solder, (N) Inlet connection, (O) Outlet connection, (P) Thermostatic bulb.

Method of Testing Valves

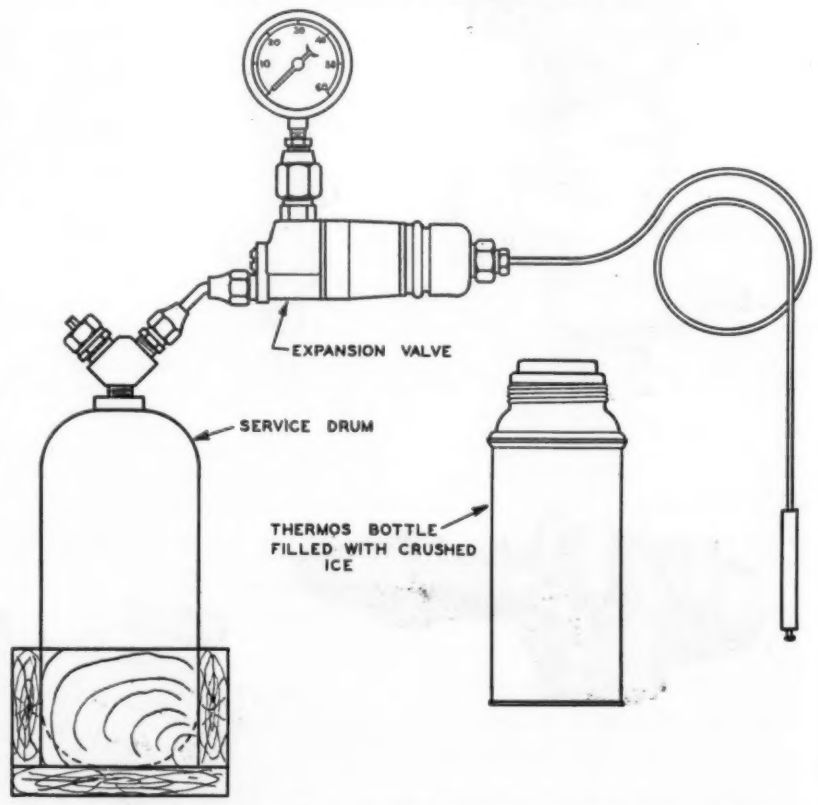


Fig. 4—Set-up for testing expansion valves, showing method of hooking-up equipment and materials needed.

Operation, Use, Installation and Regulation of Thermo Valves

By F. D. Turner, Alco Valve Co., Inc., St. Louis

ALCO thermo valves are actuated only by the superheat in the refrigerant as it leaves the evaporator. Superheat is the additional heat absorbed by a refrigerant when its temperature becomes warmer than the temperature corresponding to the evaporating pressure. The remote bulb of the valve is placed in contact with or inserted in the suction line at a point near the outlet of the evaporator.

At the start of the refrigeration cycle the evaporator is comparatively warm and the suction gas is superheated. Since the pressure in the remote bulb is proportional to its temperatures and since its pressure is, therefore, greater than the evaporating pressure and since the bulb pressure is transmitted to the chamber above the valve diaphragm by means of the capillary tubing, the valve is opened according to the refrigeration requirement.

Below the diaphragm, the suction pressure of the system as transmitted through the equalizing port, together with the pressure of the adjusting spring, opposes the bulb pressure.

As the evaporator cools, the pressure above the valve diaphragm decreases due to the cooling of the remote bulb. The thermo valve, therefore, closes in proportion to the reduced pressure above the diaphragm.

At zero superheat or when the pressures above and below the diaphragm are equal, the valve closes. Thus it will be seen that Alco thermo valves are variable pressure valves automatically feeding the required refrigerant to the evaporator.

Application

While Alco thermo valves are applicable to any type, or style of low side evaporator, the most extensive application is on installations where several evaporator coils are contained in one system or connected to one or more compressors.

If all units are connected in multiple, the evaporating surface for each unit can be designed for maximum efficiency, and if a thermo valve of the proper capacity is installed in the liquid line to each unit, the valves may be independently set to automatically maintain the desired conditions in each room or fixture regardless of either the location in the line or changes in load conditions.

Where there is a pressure drop of more than 4 or 5 lbs. between the inlet and outlet of the coil, a false pressure at the valve outlet will be created, thus interfering with the proper action of the valve.

In such cases as well as all cases where the maximum superheat must be very low, it will be found advisable to use a thermo valve having an external equalizing tube connecting the equalizing port in the valve body to an opening in the coil several inches beyond the location of the remote bulb.

While it is seldom necessary to use magnetic stop valves with Alco thermo valves, certain extreme conditions may exist where their use is advisable.

If the temperature difference between the two or more refrigerated fixtures or rooms in a multiple system is more than 20° F., an Alco magnetic suction stop valve should be installed in the suction line from the warm unit to prevent the condensation of refrigerant in the cold unit during shut down periods.

Furthermore, in the absence of a magnetic suction stop valve, the continued operation of the compressor for the proper cooling of the colder units would pump out the evaporator coils of the warmer units, causing those units to become too cold even though the liquid feed to those units be entirely shut off.

If the temperature difference between the refrigerant and the unit being cooled is less than 10° F., an Alco magnetic liquid stop valve should be installed ahead of the thermo valve on each unit having this condition.

The stop valve is necessary due to the fact that under a very close temperature differential, very little superheat is ever created and the thermo valve must be adjusted accordingly. Without a magnetic liquid stop valve the thermo valve might permit some liquid refrigerant to enter the evaporator during shut down periods.

Each Alco magnetic stop valve is controlled by a thermostat placed in the unit affected. If the compressor is thermostatically controlled, the thermostat operating the magnetic valve may be single pole if the magnetic valve is equipped with a pilot switch; otherwise the thermostats must be double pole.

Furthermore, one pole of each double pole room thermostat or the electrical connections of each pilot switch must be wired in parallel with the starter to cause the compressor to start when any room requires refrigeration and to stop when all rooms or fixtures are down to temperature.

If the compressor is controlled by a suction pressure switch, pilot switches are not necessary on the magnetic valves; and single pole thermostats may be used exclusively and wired only to the particular magnetic valve or valves which they control.

Installation

An Alco thermo valve should be installed in the branch liquid line leading to each evaporator unit, and as near as possible to the evaporator inlet.

Be sure the thermo valve and the evaporator coil for which it is intended are both of proper capacity for the requirement. Be sure the valve is intended for operation with the refrigerant being used in the system.

The thermo valve may be installed to feed liquid refrigerant into either the top or bottom of an evaporating coil, and the suction line inlet may be located at either top or bottom.

The proper location of liquid and suction connections is contingent upon the design of the evaporator and the velocity of the gas as well as the requirements of the job, and should be arranged accordingly.

The thermo valve may be located in any desired position in either a vertical or horizontal pipe line, and may be placed either inside or outside the cold area, but there must *never* be any restriction, such as a hand expansion valve or a distributor, in the line between the valve and the evaporator, unless the thermo valve is provided with an external equalizer.

A filter should always be used on the inlet side of the valve regardless of any master filter that may exist elsewhere in the system.

If a magnetic stop valve is used in combination with a thermo valve, the sequence of installation is filter, magnetic valve, and thermo valve.

A full opening, hand operated, stop valve is recommended for installation both ahead of and behind each thermo valve or combination.

The remote bulb should always be located *inside* the cold area and be attached to the evaporator near its outlet, or to the suction pipe near the evaporator. A horizontal position is preferable.

On water or brine tanks, the remote bulb should be attached to the evaporator or suction pipe inside the tank and below the liquid level.

If, for any reason, the remote bulb must be outside the cold area or in a location subject to high velocity air or other media, or where the temperature surrounding it is not comparable to the temperature required, an insert bulb should be used, or the external bulb and the suction line to which it is attached should be heavily insulated. Insert bulbs are recommended for all "short pass" evaporators.

Before attaching the external remote bulb to any surface, clean that surface thoroughly with a file and apply aluminum paint if the surface is iron or steel. See that the entire length of remote bulb makes contact with the surface, then attach firmly with clamps supplied.

Insert bulbs are applied through one end of a tee in the suction line. A horizontal position is preferable. Attach one end of the tee to the suction pipe. Continue the suction line from the angle outlet of the tee. Tighten the attachment but be sure the capillary tubing does not become sharply bent or twisted during the operation. Insert bulbs are recommended in all cases where the actuating superheat must be very low.

Insert bulbs are recommended for all "short pass" evaporators.

When there is a pressure drop of more than 4 or 5 lbs. across the evaporator, a thermo valve having an external equalizing tube should be used. Tap the suction line just beyond the location of the remote bulb, insert a fitting, then attach the equalizing tube. See that all joints are tight and that the equalizing tube will permit free passage of gas between the suction line and the tapping in of the valve.

On horizontal remote bulb applications see that the capillary tubing turns upward from the end of the bulb. On vertical applications see that the tubing is at the top of the bulb. *Never install either type of remote bulb in any location where liquid refrigerant will trap. Handle capillary tubing carefully.*

Always see that the system is thoroughly clean before installing thermo valves. Never blow the system with the valves in the line.

Be sure there is plenty of refrigerant in the system.

Regulation

There is only one adjustment, and that is for changing the actuating superheat. This is accomplished by the small stem which projects from the valve and which varies the compression of the adjusting spring. This stem is set at the factory at approximately the proper point. It is obviously impossible, however to predetermine all conditions and, therefore, some adjustment may be necessary on the job.

Do not make any adjustment until the plant has been in operation for one-half to one hour unless absolutely necessary. After this length of time, if adjustment is necessary, proceed as follows:

If the evaporator coils do not cool completely, or if the actuating superheat is too high, screw the stem to the left. This will reduce the spring compression, and decrease the superheat required to actuate the valve.

If the coils are too cold, if the machine pumps liquid, or if the actuating superheat is too low, screw the stem in the right-hand direction. This will increase the spring compression, and increase the superheat required to actuate the valve.

When making these adjustments, turn the stem only one turn and wait long enough to observe results before making any further adjustment. Always tighten the packing nut on the adjusting stem after each adjustment. Adjust only one valve at a time.

Change the location of the remote bulb for adjustments beyond the limits of the adjusting stem, or change the valve to one of larger or smaller capacity as required.

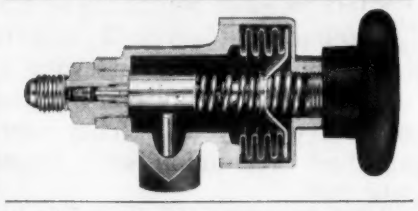
Do not attempt to use this valve as a stop valve. It can not be closed by hand.

F. & H. Puts Disc in Place of Needle in Automatic Valve

DETROIT—A full-floating "needleless" automatic expansion valve has recently been introduced by the F. & H. Mfg. Co. here.

Principal features of the valve are that a disc replaces the needle, and that no liquid comes in contact with the bellows or springs on the inside of the valve.

Range of the valve is from 25 inches of vacuum to 25 lbs. pressure. Orifice



is .093 on standard models, and can be furnished up to .194 if desired.

The adjusting screw is covered by a soft rubber cap. The valve can be instantly flushed by downward pressure on the adjusting screw without removing the rubber cap over the adjusting screw and without changing the adjustment.

Bellows in the new valve are soldered to the valve body thereby making a gas-tight connection. Springs, disc, and seat of the F. & H. valve are a non-corrosive material.

FITTINGS

How Fittings Were Designed For Refrigeration Industry

By B. V. Unwin, Advertising Manager, Commonwealth Brass Corp.

THE modest beginning of the automatic refrigeration industry found the original makers equipping both domestic and commercial installations with pipe and tubing fittings originally designed for the automotive industry. At that time the fittings numbered only 10. They were a tube union with male end, another tube union with female end, and a third with double tube ends.

There were long and short nuts to take flared tube fittings, an elbow with male pipe end and another with two tube ends and a third with a female pipe end and one tube end.

Three tees were provided, one with three tube ends, and two with pipe ends on the branch and on the run. These fittings were all that the pioneer manufacturer had to work with.

Due to the evolution of the industry from an infant to a giant in a comparatively short time, the number of fittings designed and manufactured for refrigeration alone has reached remarkable proportions.

About all that is left of the original fittings is the retention of the S.A.E. threads and seats and the standard pipe thread. Materials, design, method of manufacture and test, as well as improved formulas for wall thicknesses have all been the work of specialists in fittings for the refrigeration industry and it is now unthinkable to consider automotive fittings as having any relation to the refrigeration picture.

In the matter of material only, while the original fittings were often made from castings, the use of castings is tabu for refrigeration purposes, because of the inadequate density of cast metal to confine the refrigerant gases.

To understand the difference in the molecular structure of castings, extruded rod and forgings attention is drawn to the micro-photographs of each which we show here.

Refrigerant gases must be confined without danger of seepage and as will be noted, the granular structure of castings is too coarse to do this work so that all modern fittings are made from either rod, for straight fittings, or forgings for shapes.

The tougher metal produced by extrusion or forging is required to withstand the abuse of mechanics, the strain of being drawn very tightly when connections are completed, and the building up of pressures far beyond anything encountered in the automotive business.

The flared tube fitting was a heritage or a borrowing from the older business of automobile making. We still retain the idea of making the tube connection by flaring the tube ends, tubing employed having a minimum wall thickness of .035 in. but the idea has been abandoned of using the same tolerances.

Originally a "free" fit was considered sufficiently tight, but today the No. 2 fit is standard and it is much closer and makes a much tighter joint than the "free" fit.

Today the refrigeration engineer has a choice of several hundred fittings to enable him to make a better job of connection and most refrigeration people accept this condition as a matter of course, although the development of fittings has progressed quite as much as any other branch of the art of refrigeration.

It is quite remarkable, in spite of the fact that there has been no exchange between various manufacturers, that fittings of one manufacturer are interchangeable with any other and this condition is a tribute to the good sense of fitting manufacturers who seem to have had, ever since fittings were needed for the business, the good sense to cooperate with manufacturers of equipment and not endeavor to set up trick sizes of pipe thread, in an effort to attract business to themselves without consideration of the effect the confusion of styles would have on the industry as a whole.

All standard fittings continue to be made with 45° flare and S.A.E. thread dimensions, combined with Briggs Standard pipe thread for connection of copper tubing to iron pipe nipples or taps.

Fittings of today are made in light, standard and extra heavy patterns, they are furnished not only in brass but are often plated and electrotinned. They all meet the requirements of the American Safety Code (American Standard B9—1930) which requires the following Minimum Test Pressure.

Refrigerant	High Side Lbs.-Inch	Low Side Lbs.-Inch
Carbon Dioxide	1500	750
Ethane	1100	550
Propane	250	125
Methyl Chloride	175	125
Sulphur Dioxide	135	100
Isobutane	135	100
Butane	100	50
Ethyl Chloride	100	50
Methyl Formate	30	15
Dichloromethane	15	15
Dichloroethylene	15	15
Trichlorethylene	15	15

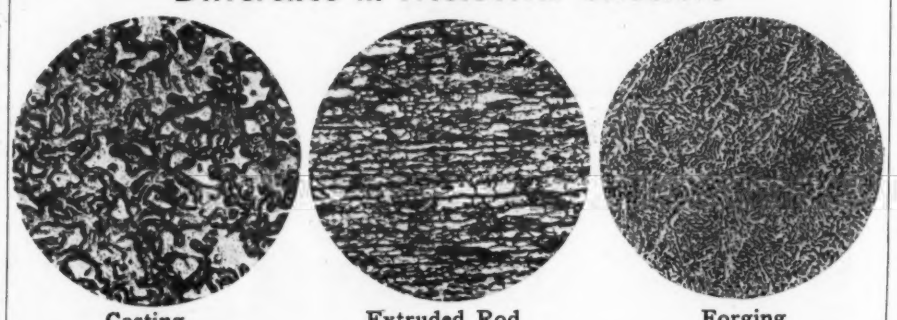
Modern forged fittings have been subjected to hydrostatic pressure of more than 2,000 lbs. to the square inch without failure or apparent distortion.

Talking about individual fittings for the refrigeration business the engineer now has, as standard fittings, regularly manufactured and available invariably from stock, a choice of long and short forged nuts, long and short rod nuts, 11 standard connectors in every wanted size, reducers and increasers, internal and external strainer connectors, three distinct types in many sizes of elbows, tees to accommodate any ordinary conditions, crosses, plugs, sealing caps, and bonnets, as well as a range of nipples in any length from close to 6 in. All these are standard and produced in immense quantities.

All of the fittings mentioned are available for use in semi-standard types, permitting variations of sizes and combinations of pipe and tube ends. The manufacturing custom is to make prompt shipments of these semi-specials. Departures from standard size threads are not encouraged as a rule, because of the loss of interchangeability.

Most people in the refrigeration business are inclined to look upon the fitting as in the class of nails, something to be had when wanted, but not sufficiently interesting to be of great concern, yet it is a fact, that, had no fitting suitable for he refrigeration industry been developed, it would have died a-borning, because no installation is stronger than the connections which enclose refrigerant lines.

Difference in Molecular Structure



Casting — Extruded Rod — Forging

84-ft. Bar in Akron Is Outfitted with 8 Temprite Coolers

AKRON, Ohio—Eight Temprite instantaneous beer coolers have been installed in the new bar especially designed by Brunswick-Balke-Collender Co. for Stone's Grill, 207 South Main St., here.

The bar, said to be one of the largest in the country, is 84 ft. long, running the entire length of the grill. There are two tap stations, of 35 ft. and 42 ft.

In addition, the installation includes a 10-ft. refrigerated four-lunch section in the back bar, and two 5-ft. two-bottle cooler sections.

Refrigeration load is handled by a 3-hp. water-cooled Kelvinator compressor, 440 volt, single phase, 60 cycle a.c.

Tupper Lake Dealer Sells Units to 18% of Market

TUPPER LAKE, N. Y.—By using multifarious forms of advertising and sales promotion to boost sales of General Electric refrigerators, William H. White, head of White's Music and Electric Store here, has sold refrigerators to 18 per cent of the town's 1,400 electric meter users. Besides this, he has sold a large quantity of radios, washing machines, and some electric ranges.

"We use newspaper, direct mail, and outdoor advertising," Mr. White states. "We also use spot radio announcements and truck banners, and we occasionally run advertisements in the classified columns."

Also put to use is the G-E distributor's kitchen sales coach for demonstrations.

Fedders Develops Method Whereby Service Man Can Make Heat Interchanger

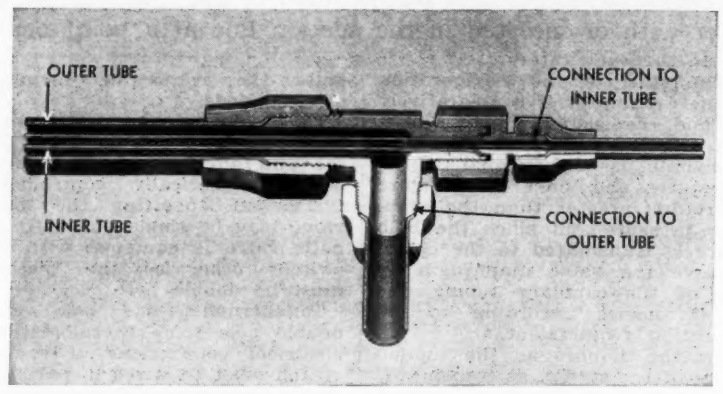
BUFFALO—Fedders Mfg. Co. has developed a procedure for service men who wish to make their own heat interchanger assembly.

The heat interchanger provides a means of meeting special problems encountered in the field where increased efficiency and economy are essential.

One of the features of this fitting is that it requires no soldering.

The cutaway view just below shows how this assembly provides an inlet and outlet connection for two concentric tubes placed one within the other.

The other illustrations demonstrate the method of putting the heat interchanger assembly together.



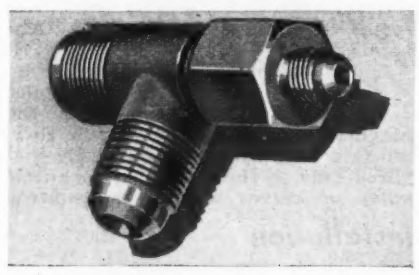


Fig. 1—Start with one set of two pair Fedders "Make Your Own" heat interchanger fittings.

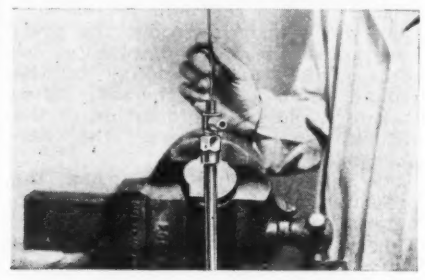


Fig. 7—Insert peening rod about ¼ in. into inner tubing.

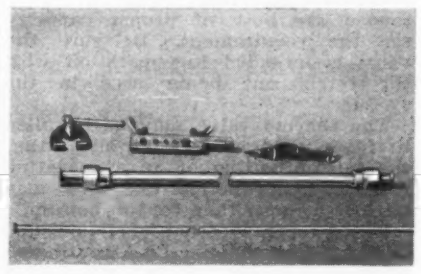


Fig. 2—Flare both ends of the outside tube.

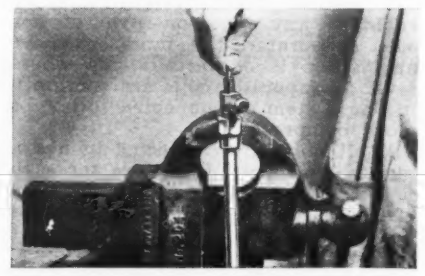


Fig. 8—Then peen inner tube over "T" connector with rod provided for this purpose.

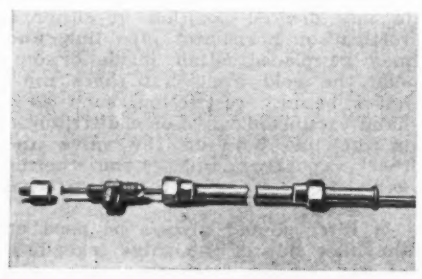


Fig. 3—Insert inner tube in outer and slip one "T" connection at one end. Flare inner tube at this end with ordinary flaring tool.

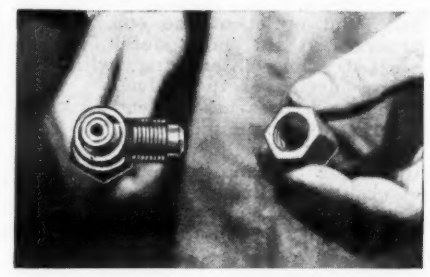


Fig. 9—The peening operation keeps the inner tube from creeping when final connection is made.

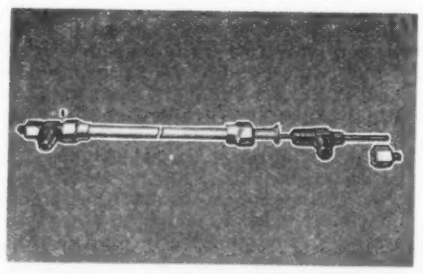


Fig. 4—Tighten large flared nut and "Make Your Own" as shown at left. Slip "T" connector over inner tube as shown at right.

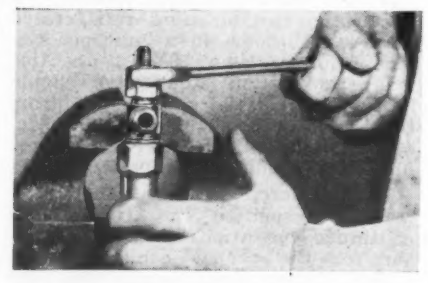


Fig. 10—"Make Your Own" connection as shown.

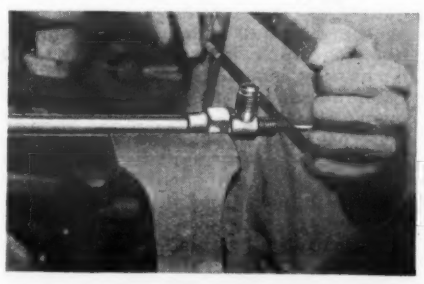


Fig. 5—Tighten flared nut against "T" connection and saw off inlet tube flush with "T" connector.

Fig. 11—Roll heat interchanger around a barrel or any round object into any desired size or shape.

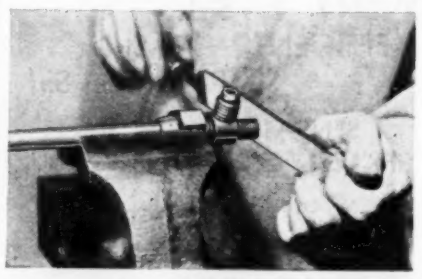


Fig. 6—File inner tube smooth and remove burrs.

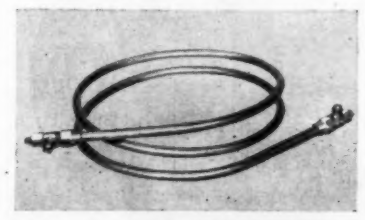


Fig. 12—Typical heat interchanger when completed with Fedders "Make Your Own" fittings.

MASTER SERVICE MANUAL

Chapter 7—Installations

Correct Methods of Using Fittings in Making Joints

By K. M. Newcum

75. Care in Making and Testing Joints

Care in making all joints tight and properly testing each joint and connection for leaks at the time of installation is important.

Flare fittings supplied for refrigeration work are made from either forged brass or extruded rod. They are seepage proof at pressures far in excess of normal operating pressures. Flare nuts and formed fittings made from hot forged brass and of the refrigeration type only should be employed, to the exclusion of bar stock, or cast brass nuts and fittings.

Forged brass formed fittings and nuts will successfully withstand expansion and contraction caused by temperature changes, and will not split or crack under these conditions.

A carelessly made joint with a very slight leak will result in a service call. Where the joint is on the high pressure side of the system, a continuous loss of refrigerant is inevitable.

Where the joint is on the low pressure side and the pressure is above 0 lbs. gauge a refrigerant loss will also result. Where the low side pressure is below 0 lbs. or in a vacuum air will be drawn into the system during the running cycle, and refrigerant will leak out during the off cycle.

Any or all of these conditions may start a series of service difficulties which could have been avoided by taking proper precautions at the time of installation.

Tubing improperly run and insecurely fastened at the proper points may set up a rattle due to the vibration of the condensing unit. This may result in an unnecessary service call.

A loop or sweep should always be left in both the liquid and suction lines, between the point where they are last fastened to the wall or back of the cabinet, and where they are connected to the condensing unit. This loop or sweep will absorb the vibration, and prevent the tubing from cracking or breaking at the fittings on the condensing unit.

The cabinet should be level. The evaporator should be level. This is very important with the low side float type.

Where the evaporator is not level may be detected easily by the ice in the trays. The ice will not be even at different points in the trays, giving an indication of which way the cabinet and/or evaporator should be tilted to level it. The ice cube trays should be filled about three-fourth full of *clean water*. They should be removed and cleaned after each defrosting.

Defrosting at regular intervals is important to good operation. The average user is of the opinion that the heavier the coating of frost on the evaporator the colder the refrigerator, whereas the thicker the coating the higher the temperature, as the frost acts as an insulator between the warm air in the refrigerator and the refrigerant. For most cases complete defrosting once each week is recommended.

Both oil wells of the motor should be completely filled to the overflow point at the time of installation. With most motors this filling is sufficient for a period of one year. It is considered good policy, however, to instruct the user to add a few drops of oil to each bearing once each month.

The belt tension should be checked, and adjusted if necessary at time of installation. The alignment of the pulleys should also be checked. All service valve caps should be replaced and tightened to their respective positions. All bolts, particularly those around the condensing unit, should be tightened to prevent their loosening up in service and causing a rattle. The user should be instructed as to the proper use of the cold control.

Duco cabinets should be cleaned with Duco polish, or may be washed with a solution of luke warm water and pure hand soap. Porcelain cabinets may also be cleaned with warm water and hand soap.

Door gaskets should be cleaned with carbona, as it will not affect the gasket. Strong soaps or cleaning solutions will affect the gasket and cause it to stick to the cabinet and tear apart.

The principal materials used in the installation of household electric refrigerators are copper tubing and fittings. Refrigeration tubing is deoxidized, dehydrated, and sealed. It is seamless to prevent splitting while flaring and to preclude any possibilities of leaks at the seam caused by bending. The tubing lends itself to bending and flaring without difficulty.

The table (Fig. 125) gives the actual OD sizes, stubs gauge, wall thickness, weight per thousand feet, and the estimated number of feet per pound, of the standard refrigeration tubing. It is available in 20, 50, and 100-ft. coils. Fig. 126 shows a typical coil of tubing.

Where tubing is so located that there is a possibility of its coming in

(*Concluded on Page 10, Column 1*)

Master Service Manual To Be Published About Jan. 1

Published in this issue is Chapter 8, Instalment 2 ("Installation of Refrigerators") of the Master Service Manual, prepared by K. M. Newcum. The manual is being published serially in Electric Refrigeration News, the first instalment appearing in the April 10, 1935, issue. When all the chapters have been published in the News, the information will be put in book form, with considerable supplementary material.

This manual of information on the design and operation of present-day refrigeration systems will add to the service man's knowledge, and will assist him in meeting specific problems in servicing operations in the field.

Our supply of some of the back issues has been sold out. In order to meet the demand for the complete series we make the following offers to service men:

(1) Send $3.00 for a year's subscription to Electric Refrigeration News to start Aug. 28, 1935, and we will send reprints of all previous Newcum articles (the first six chapters of the book) in pamphlet form (size 6¼x8¾ inches).

(2) Send your advance order for a copy of the Master Service Manual, enclosing $3.00 to pay for the complete book, when published, and we will send you free of charge, reprints of all the Newcum articles published in the News up to and including Aug. 21, 1935. These reprints will be in pamphlet form (size 6¼x8¾ inches).

Following is an outline of the subjects and the dates of the weekly issues of Electric Refrigeration News in which the material was published:

Chapter 1—THEORY OF REFRIGERATION (April 10).
Chapter 2—PRINCIPLES OF MECHANICAL REFRIGERATION (April 17).
Chapter 3—COMMON REFRIGERANTS (April 24).
Chapter 4—CONDENSING UNITS.
Instalment 1: description of various compressor parts (May 1).
Instalment 2: stuffing box seals, flywheels, and direct-connected units (May 8).
Instalment 3: rotary compressors (May 29).
Instalment 4: care and servicing of shut-off valves and gaskets (June 5).
Instalment 5: condensers (June 12).
Instalment 6: liquid receivers (June 19).
Chapter 5—EVAPORATORS.
Instalment 1: flooded evaporators with low side float valve (June 26).
Instalment 2: high side float valves and flooded evaporators (July 3).
Instalment 3: automatic expansion valves (July 10).
Instalment 4: automatic expansion valves —continued (July 17).
Instalment 5: thermostatic expansion valves (July 24).
Chapter 6—CONTROLS.
Instalment 1: low pressure controls (July 31).
Instalment 2: low pressure controls—continued (Aug. 7).
Instalment 3: thermostatic controls (Aug. 14).
Instalment 4: thermostatic controls—continued (Aug. 21).
Chapter 7—MOTORS.
Instalment 1: repulsion start-induction run motors (Aug. 28).
Instalment 2: repulsion start-induction run motors (continued) and capacitor motors (Sept. 4).
Instalment 3: direct current motors and belts (Sept. 11).
Chapter 8—INSTALLATION
Instalment 1: installation of refrigerators (Sept. 18).
Instalment 2: correct methods of making fittings for installations (Sept. 25).

Tubing

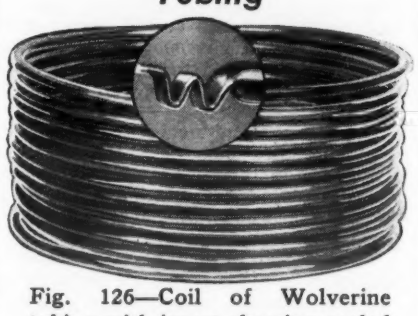


Fig. 126—Coil of Wolverine tubing with insert showing sealed end.

Typical Fittings

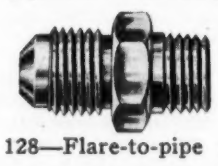


Fig. 128—Flare-to-pipe union.

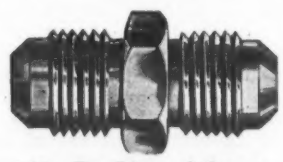


Fig. 129—Double-end flare union.

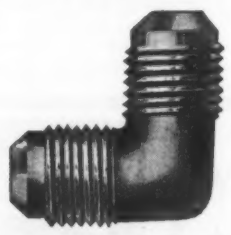


Fig. 130—Flare elbow.

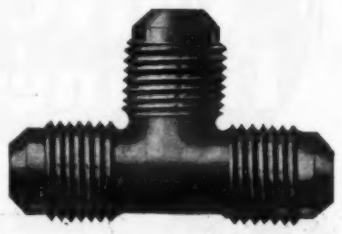


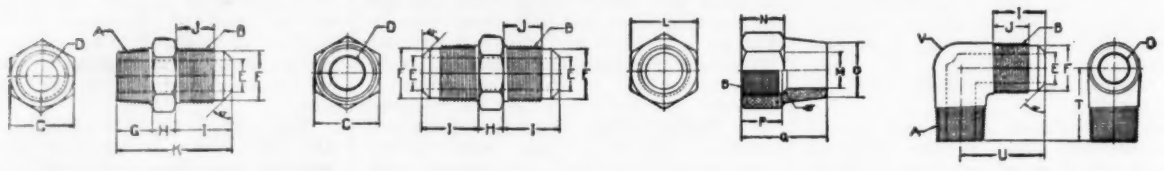
Fig. 131—Three-way flare tee.

Fig. 125 Data on Standard Refrigeration Tubing

Sizes O. D.	Stubs Gauge	Wall Thickness	Weight Per M P	Estimate No. Ft. Per Lb.
3/16	20	.035	65 lbs.	16½
1/4	20	.035	92 lbs.	11
5/16	20	.035	119 lbs.	8½
3/8	20	.035	145 lbs.	7
7/16	20	.035	171 lbs.	6
1/2	20	.035	198 lbs.	5
5/8	20	.035	251 lbs.	4
3/4	20	.035	304 lbs.	3¼

Fig. 127—Refrigeration Fittings Specifications

(Adopted by the Refrigeration Valves and Fittings Association)



O. D. Tube Size	A*	Thread Size B	C	D	E	F	G	H	I	J	K	L	M Min.	M Max.	N	O	P	Q	T	U	V
3/16	1/8	3/8–24	7/16	1/8	5/32	19/64	3/8	3/16	3/8	9/32	15/16	3/4	.192	.197	7/16	15/32	9/32	15/16	3/4	3/4	3/32
1/4	1/8	7/16–20	9/16	3/16	7/32	11/32	3/8	3/16	1/2	11/32	1 1/16	3/4	.255	.260	7/16	15/32	11/32	15/16	3/4	7/8	1/8
5/16	1/8	1/2–20	5/8	7/32	1/4	13/32	3/8	7/32	9/16	3/8	1 5/32	3/4	.317	.322	7/16	15/32	3/8	15/16	3/4	15/16	1/4
3/8	1/4	5/8–18	3/4	9/32	5/16	17/32	7/16	1/4	5/8	15/32	1 5/16	7/8	.380	.385	1/2	9/16	7/16	1 3/32	7/8	1	9/32
7/16	1/4	11/16–16	13/16	5/16	11/32	37/64	7/16	9/32	11/16	7/16	1 13/32	1	.442	.447	19/32	3/4	1/2	1 3/16	15/16	1 1/8	5/16
1/2	3/8	3/4–16	7/8	13/32	7/16	41/64	1/2	5/16	3/4	1/2	1 9/16	1	.505	.510	19/32	3/4	9/16	1 3/16	1	1 3/16	11/32
5/8	1/2	7/8–14	1	1/2	17/32	3/4	9/16	3/8	7/8	19/32	1 13/16	1 1/8	.630	.635	23/32	15/16	11/16	1 7/16	1 1/4	1 7/16	5/8
3/4	3/4	1 1/16–14	1 3/16	11/16	23/32	15/16	5/8	3/8	1	23/32	2	1 5/16	.755	.760	7/8	1 3/32	13/16	1 3/4	1 3/8	1 5/8	5/8

*Briggs Standard Taper Pipe Thread.

Correct Use of Fittings in Installing Household Electric Refrigerators

(*Concluded from Page 9, Column 5*)

contact with foodstuffs, it should be tin plated, to prevent discoloration and possible contamination of the food. Where the tubing is so located that it is subject to mechanical injury it should be covered with greenfield tubing, or conduit.

Where the tubing is run through flooring, and there is a possibility through scrubbing of the floors for strong cleaning solutions to come in contact with the tubing, it should be protected with a galvanized pipe up to sufficient height to prevent this.

The opening in the refrigerator through which the tubing is admitted should be sealed at the time of installation with hot hydrolene.

The specifications of refrigeration fittings as adopted as standard are given in Fig. 127. A typical flare-to-pipe union (Fig. 128), double-end flare union (Fig. 129), flare elbow (Fig. 130), and three-way flare tee (Fig. 131) are shown on page 9. The fittings illustrated are typical of the many sizes and types of refrigeration fittings available. Standard flare fittings are available in all OD tube sizes from 3/16 in. up to and including ¾ in.

Fig. 132 shows the heavy forged brass flare nut. This type of nut provides the tube support necessary to support the flares from vibration at and around the condensing unit.

Where this type of nut is used in the expansion part of the system or in any part of the system where it will be subjected to frosting and defrosting, it is possible for the space between the tube and the tube support on the nut to fill up with water on the defrost cycle and freeze on the frost cycle.

As the tube support will not split or give away to the pressure caused by the expansion of the ice in this confined space, the pressure or pressing action of ice may cause the tube to be mashed slightly on each freezing cycle. This collapsing of the tube may cause a serious line restriction.

Where this type of nut is in service or being installed in this part of the system, the space between the tube and the tube support on the flare nut should be filled with a suitable compound to prevent water from filling the cavity. There are compounds for this purpose which are impervious to moisture at all temperatures from –55° F. to 212° F., which are very satisfactory for sealing these fittings.

A special flare nut known as the short or frost proof nut is shown in Fig. 133. Note the tube support has been reduced in length so that it does not provide a space for the water to collect and freeze, hence precludes the possibility of mashed or collapsed tubing. Its use is recommended where frosting and defrosting is possible. It is available in all sizes up to and including ¾ in O.D.

Brass Flare Nut

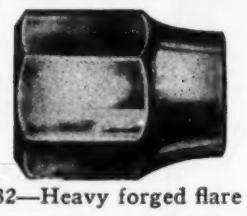


Fig. 132—Heavy forged flare nut.

Frost-Proof Nut

Fig. 133—Short flare nut.

Mueller Engineer Tells How Hard Solders Affect Tubing

Mueller Brass Co.
Port Huron, Mich.

Editor:

We have read with considerable interest S. J. Benn's letter as published in ELECTRIC REFRIGERATION NEWS of Aug. 14, 1935.

We wish to clarify our position regarding the subject of the correct means of making solder joints with streamline fittings and installing refrigerant lines and fittings.

In general, we are not opposed to high melting point or so-called hard solders. There are certain applications where hard solders are preferable and we have certain assemblies in our own factory where we use these solders.

We believe, however, that it is not good engineering to design a piping system with hard drawn copper pipe of certain physical characteristics and then weaken this system by annealing with heat the pipe at each joint.

In making a hard solder joint every physical characteristic of the copper tubing is changed in a few inches of the tubing which is adjacent to the fitting. Further, it appears to us that the oxides and scale formed on the inside of the pipe from high temperature soldering are objectionable in a refrigerating system.

We feel that the actual risks, due to the possibility of toxic decomposition products of refrigerants, injuring occupants or firemen in a burning building are very slight. The products of decomposition of Freon for example are highly soluble in water and would tend to be counteracted by the hose streams.

From results of authoritative tests we note a striking similarity between decomposition products of Freon and those of carbon tetrachloride. The chief difference is that Freon will result in a certain amount of HF in addition to HCl and other products.

Under most conditions from equal concentrations of Freon and carbon tetrachloride, the percentage of HCl from carbon tetrachloride is as great or greater than the combined percentage of HCl and HF resulting from Freon. Carbon tetrachloride is used universally as a fire extinguisher and is deliberately introduced to burning structures.

It therefore appears somewhat incongruous to consider Freon as presenting a fire hazard in case fire would melt the solder in the joints of a refrigeration system.

We, too, are of the opinion that the hazards of installing lines with high melting point solders have not been sufficiently emphasized. Nearly every installation engineer can use a blow torch with comparative safety. Gases required for high temperature soldering require much more careful handling and training in their proper and safe use.

Our research laboratories have been busy on the development of improved ideas. The results of these developments will be available to the trade in the very near future.

J. E. GRAY,
Refrigeration Engineer.

Imperial Brass Markets New 'Hi-Side' Float

CHICAGO—Highly accurate control is one of the principal claims made for the new "Hi-Side" float recently put into distribution by the Imperial Brass Mfg. Co.

This float is designed to offer a positive control of the flow of the refrigerant into the evaporator, and has new features which make it suitable for use with all types of refrigerants.

It is provided with an adjustable by-pass from the high to the low side, which accomplishes a purge whenever a vapor-bound condition develops.

Developments in Manufacture of Valves & Fittings Since 1924

By John S. Forbes, Kerotest Mfg. Co.

IN a little more than a decade, the manufacture of refrigeration valves and fittings has undergone a rapid evolution of improvement, development, and expansion. Prior to 1924, the refrigerator manufacturers made their own valves in very small experimental quantities, but with the rapid expansion of the industry and the insistent demand for better valves in larger and larger quantities, the need for quantity production of quality valves was apparent.

To meet this demand, Kerotest made up what was probably the first commercial shipment of valves to the order of the Frigidaire Corp. In these early days, the refrigeration engineers resorted to the use of SAE flare connections, nuts, and fittings—a carryover from the automotive industry where flare connections were so generally used.

These flare type valves consisted of compressor valves for use in suction and discharge lines and angle type valves for use on liquid receivers. They were made of heavy, cumbersome brass castings with exposed stems, depending only on the packing to hold the gas—a far call from the compact diaphragm packless forged valves of today.

In fact, a first major improvement in refrigerator valves was the forging method which eliminated the inherent defects of castings such as porosity, cracks and checks. Forgings also made possible stronger, lighter and more compact valves. Since that time, the trend has been toward making the valves and fittings more compact, reducing the cost, and simplifying the design.

Because of the necessary small dimensions and size of valves for refrigerator installation, stronger metals were necessary, culminating in a forged brass body and a bronze stainless steel stem.

The second important improvement was the seal cap which eliminated the old exposed stem design by providing a metal housing and effecting a positive seal against leakage.

With the development of the industry, larger capacity valves and fittings became in great demand and as a result Kerotest introduced a new line of forged steel valves in 1928. The forged steel construction made it possible to combine maximum strength with minimum size.

About this time, the commercial demand for mechanical refrigeration had grown to a point where the existing single unit systems were not economical, a separate compressor being needed to feed each cold storage unit. As the investment in these compressor units ran into hundreds of dollars, the centralized compressing system was evolved. The new system made it possible to feed several refrigerating units in different parts of a building from one compressing plant, thus marking a great improvement in the efficiency and economy of multiple unit systems.

This new system developed a need for a complete new line of valves known as line shut-off valves to control the flow to and from the various units. Some of these, known as two-way valves, simply controlled the flow of the refrigerant—others were designed to control the flow to a by-pass line.

This marked the advent of the individually refrigerated apartment house—with a centralized compressor feeding the evaporators of a number of apartments. A further important step in the simplification of the complex multiple installations then in use, was the development of manifolding conceived by E. H. Goodison, formerly service manager of a Kelvinator distributorship. This resulted in the neat, compact panel board mounting of manifold tubes and valves used today and standardized multiple unit installations.

Because of the possibility of fire in refrigerated buildings, the line shut-off valves were centrally located in the basement. To provide a quick turn-off for the fireman or janitor, in case of emergency, the so-called wing nut seal cap was suggested by Mr. Timkey, former service manager of a Frigidaire distributorship. This wing nut cap was provided with a hollow square and served the dual purpose of a seal cap and wrench.

In such emergencies, however, the human element entered into the picture. Either the janitor or fireman failed to completely shut off the valves and as a result the Kerotest diaphragm packless valve was designed in 1930 which provided a positive shut off by means of a handwheel operation.

In response to the insistent demand for a special charging stand, Kerotest developed a stand known as type 470, making possible economies in refrigerant cost.

During the past few years a number of important specialties have been introduced, chief among them being the G-W control, filters and dryers, liquid indicators, an improved pocket size gauge testing outfit at the suggestion of K. M. Newcum, and suction line strainers.

The G-W control is considered by many as a major development in refrigeration equipment since it isolated the evaporator, making it an independent unit.

The installation of filters and dryers has been very successful in eliminating service complaints since they are designed to filter out chips and sediment from the refrigerant, while the dryers prevent the formation of ice crystals by effectively removing the moisture from the refrigerant.

Suction line strainers became in popular demand in 1934—being designed to remove foreign matter in the gas side of refrigerator lines.

Today, the accelerating demand for large air conditioning and commercial refrigeration installations has created a new need for extra large valves and manifolds.

Because of the large quantities of expensive refrigerant employed in these modern installations, the problem of leakage and wastage has created a demand for the best quality valves and fittings obtainable.

On such installations, diaphragm packless valves up to 3 in., fitted with handwheels, have been made available, instead of wing nut seal caps or packed back seating valves, because of their positive sealing action.

Companion equipment to the large 3 in. diaphragm packless valves are the cadmium plated forged steel manifolds fitted with heavy steel mounting straps, permitting vertical or inclined mounting on one of the several flats of the octagon ends.

Central Brass Catalogs Air-Cooling Valves

CLEVELAND—Central Brass Mfg. Co. here has brought out a booklet which describes its line of pressure regulators, strainers, and needle globe valves for air-conditioning equipment.

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Profits from Glamour

SELLING radios has been a glamorous business. It has also been a tricky, cutthroat, cheap, shoddy (this space should be left blank for the reader to fill in his own choice uncomplimentary adjectives) business which has driven hundreds of dealers to the wall and thousands of retailers to despair.

Nevertheless, there is no gainsaying the fact that in a radio there is glamour; and now that the radio industry appears to have set its house in order in anticipation of doing a clean and wholesome business, many specialty dealers are once again getting the radio "bug."

Appliances Lack Emotional Appeal

In selling refrigerators and ranges, the retailer is dealing with *the* prime necessity of life—*food*. In selling home laundry equipment the retailer is working with another necessity—*clothing*. And in selling oil burners and air-conditioning equipment, the dealer is speaking in terms of *shelter*—and human comfort.

Despite the fact that in merchandising the products listed above the dealer is concerning himself with the fundamentals of daily living, he sometimes finds it difficult to make his story colorful, to give it appeal. It's not so easy to get dramatic about a pair of sox; nor does one normally get very emotional about a pork chop. (Perhaps that's why the refrigeration industry, almost in desperation, has overworked the "dainty frozen desserts" theme—woefully inadequate though it may be, this theme does bear a little "color," and has an appeal which is more than just strictly utilitarian.)

Ranges, dishwashers, vacuum cleaners, and washing machines can all be demonstrated. Not so the electric refrigerator. A prospect looks at it, but can't *see* anything happening. She must be *told* what it does, have its operation *envisualized* for her.

Action! Color! Drama!

But take radio, now. Ah! All the color and drama and showmanship that this teetering old world possesses is at the command of the owner of the magic little box sired by Signor Marconi. Does the interplay of international intrigue interest you? Turn the dial and listen to Haile Selassie's brother-in-law chanting from Addis Ababba. Do sports grip your imagination? Flick the knob, and the Brown Bomber comes to blows with the Livermore Larruper right in your own home. In a few days you will hear the crack of a Hank Greenberg homer—Detroit hopes—in the World Series. Feel the need of a few laughs? Hear Amos 'n Andy, or Jack Benny, or whichever purveyor of Joe Miller's time-tested gags is currently in popular favor. Like music? In one evening, without stirring from your favorite chair, the day's troubles may be assuaged by the ringing tenor of Lawrence Tibbett or the dulcet contralto of Frances Langford, by the energizing rhythms of Ray Noble or the soul-satisfying tonal landscapes of that grandest of all human musical creations—the symphony orchestra.

Self-Demonstrating Product

What a "natural" for a specialty salesman! No elaborate presentation to make, no studied story to tell. Just tune in—and the product demonstrates itself!

True, radio manufacturers do have their own particular (and trade-marked) vocabularies—ferrodynes and magic eyes and synchronodes—to lend pleasant-tasting scientific mystery to this simple marvel of today. Such is but gilding the lily. Radio, like no other product for the home, sells itself. The prospect need only *listen* to hear for himself that his old set is outdated.

Metal Tubes Speed Obsolescence

Metal tubes are the big noise—excuse us—chief appeal of the newest radio sets. Metal tubes at once make glass-tube sets obsolete. Invasion of the replacement market is in full swing. And now, at long last, the emphasis is on *quality* rather than price, on *reproduction* rather than mere distance, on *tone* rather than unused gadgets.

Discounts are longer, the average unit sale figure is higher, promotion campaigns are heavier, products are better, manufacturers and sales outlets are fewer—many are the signs which point toward a profitable autumn for progressive radio merchandisers.

Salesmanagers whose consuming interest may lie in other household appliances will save themselves worry if they cavil but perfunctorily at the claims the new sets seem to be having on the attention of their best specialty dealers. Radio, this fall, is having an inning.

WHAT OTHERS SAY

Be Case-Hardened but Not Complacent

BUSINESS is getting better. It is now steadily improving in a pre-election year, faced with a Congress which probably marks an all time low in statesmanship and an all time high in political subserviency and confronting an Administration which has proved itself to be definitely anti-business.

Steel demand is improving week by week and this without stimulus as yet either from the Government's $4.8 billion or from railroad buying. Machine tool activity during July, after consecutive monthly gains, reached an altitudinous level nearly 20 per cent above the industry's "normal" and one that was surpassed only in 1929.

Yes, business is getting better in spite of a parade of legislative and administrative hobbles and hobgoblins that would have formerly been sufficient to give it nervous prostration.

Does business thrive under punishment? Apparently so. But not because of it. Business is something like Pat's wife, who thrived under repeated beatings. It was not the beatings that made her thrive, it was the good old Irish stock that enabled her to survive the punishment. Pat probably took the credit for her good state of health.

Business is improving under hitherto undreamed of handicaps, because it is getting case-hardened to political impact. It has found that it "can take it" because of an inherited vitality handed down from generations of business forebears who conquered greater hazards than those presented by the pin pricks of politicians.

The toughening, tempering process which business has undergone will do it good, insofar as removing hesitancy in forward planning caused by fear. The danger is that if business improves enough, business men are likely to become politically complacent as well as case-hardened. Then Pat, having successfully gotten away with wife beating, might attempt plain murder.—*Iron Age.*

PWA Housing Prospects Fade

PROSPECTS of activity in the housing projects for which government money has been set aside by PWA were dimmed by the recent decision upholding the contention that the government cannot condemn private land for such projects. There are assurances that the idea of such projects is not dead, that appeals will be taken, and that local bodies will be set up to do the condemning. These statements are really social or political in character and have nothing to do with the immediate job at hand.

Even if the legal difficulties are all finally adjusted and if public sentiment finally supports the idea of publicly financed housing, it is perfectly evident that no large amount of construction can possibly come from this source soon enough to affect construction totals appreciably for a long time. PWA housing is thus relegated to a position of rapidly decreasing importance so far as any immediate large construction is concerned.

In the meantime apartment house construction by private investors continues to be one of the bright spots in the present rise of activity in building. Unless we are interested only in social problems it is certainly more to the point now to place our hopes for immediate business on the privately built apartment house than on the hope that slums may be torn down some time in the future—*Heating & Ventilating.*

LETTERS

Traveling Parts Jobber?

Heyworth, Ill.

Editor:

Are there in Chicago any wholesalers of electrical refrigeration supplies who sell their goods to dealers through traveling salesmen similar to the manner of wholesale hardware and automobile supply houses?

If you can give me the names of any such firms, I will be much obliged to you.

I do not mean distributors of any one certain line, but firms carrying a general line of supplies from flare nuts on up.

Maybe next year I will have your Buyers Guide.

TRUMAN J. BALL.

Wants to Handle Houses

Automatic Equipment Co.
Specialists in
Refrigerating Equipment and
Refrigeration Fixtures
142 Adams Ave., Scranton, Pa.

Editor:

We are interested in getting in touch with several manufacturers of prefabricated steel houses, for the purpose of representing them in northeast Pennsylvania.

We anticipate a building boom, in the next few years, and since we have a high type of specialty man out selling refrigerating equipment, household appliances, air-conditioning equipment, and stokers, we feel that selling the complete home from the ground up is an idea worth working on.

HARRY C. GLOU,
President.

Keep Service Men Posted

Debes & Company
Electric Refrigeration Supplies
1249 East 105th Street
Cleveland, Ohio

Publisher:

Your letter of Sept. 10 in regard to sample copies sent to our company. These copies have been distributed from our sales counter to service men and dealers throughout our city. We have received a few inquiries regarding subscriptions for the REFRIGERATION NEWS, and also have been asked whether we would have separate issues for sale.

However, I think it would be worth our while to go into this matter more thoroughly as I earnestly know that it would be a great help to most of the service men to keep themselves posted through the REFRIGERATION NEWS as to what new developments are taking place in the refrigeration world.

You may send us more application blanks and we will let it be known that we are out after subscriptions for the ELECTRIC REFRIGERATION NEWS. We would appreciate any further information as to any system you may have in handling subscriptions.

DEBES AND COMPANY.

Valuable to All

Home Appliance Service Co.
Refrigeration Supplies
714 Market St., Greensboro, N. C.

Publisher:

Due to the absence of the writer from the office for the past three or four weeks, your favors of Aug. 6 and Sept. 9 were withheld for my attention. We thank you very much for your offer of putting before the distributors, dealers, and service men a copy of your publication, the ELECTRIC REFRIGERATION NEWS. The writer feels confident that each one of these concerns should be a subscriber for the ELECTRIC REFRIGERATION NEWS as we have found that each issue contains valuable information regardless of the position that any one may hold in the refrigeration field.

We have been on your subscription list for the past five years that we have been in business and personally believe that we have on file each and every copy that we have received. Occasionally it is necessary to refer back to some particular information that we are desirous of having, to settle in our own minds the question involved or to explain to some prospective customer fully the information that he has requested.

As you no doubt recall, we have had several advertisements appearing in the MARKET DATA BOOK, but due to neglect we have failed to do so in the 1935 issue. However, we anticipate having at least a page in the 1936, if not two pages, and may we say here that we have had considerable inquiries and requests for catalogues from the advertisement appearing in the MARKET DATA BOOK.

The writer suggests that you send us a generous supply of the subscription order blanks and we will put them in the hands of our salesmen and, no doubt, they can pick up a number of subscribers in this territory for you. We are not so much interested in the commission that we will receive for the sale of your subscriptions as we are getting the information into the hands of parties doing service work.

W. H. PARKER,
President.

Bring the Camera

Boot & Shoe Recorder Publishing Co.
239 West 39th St., New York City

Editor:

This is a very much belated acknowledgment of your human-interest pictures.

Believe me, you tempt me to get a camera and try to do likewise. It won't be long before we will be in Washington again and be sure to bring the camera.

We really ought to have a camera division in the conference.

ARTHUR D. ANDERSON,
President, National Conference of
Business Paper Editors.

Ideas for the Manual

Dutchess Repair Service
Franklin Ave., Millbrook, N. Y.

Editor:

We received your letter of Aug. 31, 1935, and we take the liberty to ask and answer a few questions.

We are operating from a small town, within a radius of 25 miles. Most units are Frigidaires that we are servicing. Westinghouse refrigerators are in the majority, but we are shut out of that concerns service. We buy compressor replacement parts from Melchior, Armstrong, Dessau Corp., New York City. Any parts not available from them are obtained from the manufacturers direct. Replacement parts for Majestic are obtained from the Harry Alter Co., Chicago.

We would like to know who would repair hermetically sealed units (Majestic) in the vicinity of New York. Previous work was done by Stein, Chicago. We do minor repairs, like changing float valves, etc., ourselves.

As we stated before we are very much interested in your MASTER SERVICE MANUAL. We only hope it will not be written like a text book because a few good ones are on the market that cover pretty near everything.

What we would like to see is this: Complete specifications of all models giving size of compressors. What kind? What refrigerant used? How much? How much oil? What operating pressures? What cold control settings? What make cold control? Size of motor? And any other vital information necessary to efficiently service and repair the various refrigerators, domestic as well as medium sized commercial units? Let's have some more dope on your MASTER SERVICE MANUAL.

At any rate enter our subscription to ELECTRIC REFRIGERATION NEWS to start now and send us reprints of all previous Newcum articles.

ADOLPH H. KOHNERT,
Manager.

List of Service Men

L. K. McDorman
Manufacturers Agent
Building Materials
Room 510—Metropolitan Bank Bldg.
Washington, D. C.

Editor:

We understand that you have a list of independent refrigeration service men with their addresses, in different parts of the country, and we would appreciate very much receiving a copy of this list.

We have occasion to employ independent service men in all parts of the country, and a list of this sort would be of advantage to us.

L. K. MCDORMAN.

Answer: Published in the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY is a list of independent service men. However, with respect to this list, the "Foreword" to the DIRECTORY says:

"A new 'Service Section' has been added in which the non-manufacturing groups are listed. This section includes the rapidly growing groups of replacement parts jobbers and independent service companies.

"We make no claim to completeness in connection with this new section. Much time and effort has been expended in collecting information but these branches of the industry are still in the formative stage. In another year, perhaps, we may be able to furnish a more accurate and comprehensive directory of the service groups."

"Enclosed please find 10 cents in stamps for which please send me the ELECTRIC REFRIGERATION NEWS for June 12, 1935. Please tell me where I can buy this weekly regularly, as I like it very much."—Claude M. Barnhart, 1323 24th Ave., Moline, Ill.

"As a subscriber last year, we found your paper to be very interesting as well as helpful."—Jas. T. Stephenson, C. H. Stephenson Music Co., Raleigh, N. C.

"In renewing I might add that your paper has been of great help to me."—M. A. McDougall, 37 Tulip St., Summit, N. J.

"I would not be without the NEWS."—Theo. D. Clagett, 2149½ Neil Ave., Columbus, Ohio.

Sales Idea of the Week

By V. E. (Sam) Vining, Director of Department Store Sales, Westinghouse Electric & Mfg. Co.

I just heard of the death of Jim Rhodes—Showman Extraordinary.

He ran a "Magic Lantern Show."

Perhaps his fame never penetrated the black ignorance which surrounded our cities of 40 years ago, but if position in the Thespian Corner in Heaven is measured by hours of pleasure given, Jim is right now sitting in the Celestial Lambs Club comparing notes with Joe Jefferson, Sarah Bernhardt, and others exalted in "The Profession."

His travels were not wide. As those others in his day adopted Broadway as a center, slumming occasionally in the theaters of Boston and Philadelphia, Jim's sphere was the little brick schoolhouses in Mercer County, Ohio, with an occasional sortie on Van Wert or Auglaize.

Gee boy—

A thrill of excitement ran through the whole Wild Cat School District when, as kids, we ran breathlessly homeward down the pike, spreading the news we had heard at recess:—JIM RHODES and his MAGIC LANTERN SHOW. Thursday night, rain or shine, admission 10 cents.

The event almost equalled the County Fair. Every seat in the room was taken—from the little double seats up front for the smallest kids to big ones in the back. Late-comers sat on the window sills or in the aisles as best they could—

The smoking coal-oil lamps were turned down so they could do a better job of smoking, and—

The Show Was On!

Our eyes bulged with pictures of the Alps and Niagara Falls, and Jim's voice as he lectured lulled us into the feeling that such scenes actually existed. He lead us in singing Home Sweet Home as appropriate pictures were thrown on the screen before us. Then, before our tears were dry, he had us screaming with laughter as we saw the picture of a tom cat swallowing a mouse, only to have the mouse back out of the cavernous mouth and swallow the cat—a trick performed at the projector forecasting the movies.

I owe a lot to Jim.

Memories of him formed my first lessons in "Mass Selling." The fundamentals never change.

On a canvas woven from strands of sincerity and a knowledge of your business; boldly draw a picture embodying excitement, unblushing basic sentiment, and human understanding; top off in bold relief with a touch of fundamental humor—and the reactions of crowds haven't changed in a million years—whether you are selling patent medicine or politics.

God Rest Ye—Jim Rhodes.

Counter Freezer Group Entertains Druggists

CINCINNATI—The National Association of Counter Freezer Manufacturers will establish headquarters at the convention of the National Retail Druggists' Association at the Hotel Netherland Plaza here this week.

A meeting is being held for druggists attending the convention who are users of counter freezers. At this meeting the cooperative service and merchandising program of the association are to be outlined.

Apex Leases Space in Merchandise Mart

CHICAGO—The Apex Rotarex Corp. recently leased 5,000 sq. ft. of space on the 14th floor of the Merchandise Mart here, to establish a display room and service department.

This move to the Mart provides a central display room for dealers and buyers from all parts of the company.

R. J. Strittmatter, vice president in charge of sales, negotiated the lease with the Merchandise Mart.

Cable, Hansen & Hart Get New Jobs with Ferro

CLEVELAND—Three changes in Ferro Enamel Corp.'s executive personnel have been announced by President R. A. Weaver. D. L. Cable has been named sales manager, J. E. Hansen, director of service, and L. B. Hart, director of field service of the organization.

Grand Rapids Brass Supt. Dies after Operation

GRAND RAPIDS, Mich.—Elmer C. Osbeck, superintendent of the Grand Rapids Brass Co., manufacturer of refrigerator hardware, died here Saturday, Sept. 7, following an emergency operation for appendicitis.

G-E, Norge, Kelvinator To Exhibit Lines at Housewares Show

CHICAGO—Augmented by three of the leading electric refrigerator manufacturers, the list of exhibitors in the "Housefurnishings Hall of Science," that will distinguish the First International Housewares show to be held in the Merchandise Mart, Jan. 6 to 18, is growing steadily.

General Electric, Norge, and Kelvinator are to exhibit their products in the Hall of Science, it was announced recently. In addition to these, more than 105 manufacturers in the housewares field have agreed to show their products at the Merchandise Mart in this undertaking.

Not only refrigerators, but many labor-saving appliances will be part of the General Electric exhibition. Part of this company's space will be devoted to the General Electric "Talking Kitchen," displayed in the Century of Progress Exposition.

This company's "Drowned in Water" display, plus a technicolor movie, illustrating how modern labor-saving devices have lightened the work of the housewife, will be shown.

Kelvinator will feature its latest developments in the air-conditioning field, in addition to its complete line of refrigerators. Norge is sponsoring a marionette show depicting modern methods of store selling, besides its refrigerator display.

To replace commonplace promotions, the Merchandise Mart enterprise will portray in visual demonstrations the sales ideas, production methods, manufacturing processes, and distribution facilities of exhibiting firms, Mr. Corley stated.

Whenever possible, the article, or a small model of it, will be made in the Hall of Science. The Porcelain Enamel Institute will produce enamelware with a model machine, the Hanson Scale Co., will have an assembly line to build and test Hanson scales, and the Scurlock Kontanerette Corp., will portray the process of making Kontanerette's revolving stand.

Kelvinator Owner No. 298 Buys a 1935 Model

BAY CITY, Mich. — George H. Young, Sr., 89 year old pioneer of this city, recently purchased a 1935 model Kelvinator electric refrigerator, to replace his old Kelvinator, which has been in operation for 20 years.

His first Kelvinator, which carried serial number 298, was one of the first three to be installed in this city, approximately 20 years ago.

When Martin Reinhardt, retail salesman for George F. Dent, local Kelvinator distributor first contacted Mr. Young, the nonagenarian was not interested in a new model, because the old one "ran so well." The economy and convenience features of the new models finally led him to purchase one from Mr. Reinhardt.

Utility Betters Quota on Refrigerators & Ranges

SALT LAKE CITY—With a quota of 1,200 General Electric refrigerators and 1,000 G-E ranges to sell during 1935, Utah Power & Light Co. here, sold the 1,200 refrigerators by July 26 and 1,008 ranges by Aug. 14, reports W. A. Huckins, sales manager for the utility.

10 G-E's Installed in New Apartment Building

SALINAS, Calif.—Ten model L-519 Norge electric refrigerators have been installed in the new Carpenter apartment building, opened here recently. The refrigerators were sold by Breschini Refrigerator and Radio Shop, local Norge dealer.

AIR CONDITIONING

To Be Read on Arrival

Shal Myers, air-conditioning sales manager for Westinghouse, says he reads Electric Refrigeration News the moment it hits his desk.

Air Conditioning Will Be Necessity, Architects Told

DETROIT—Air conditioning will be a standard part of the homes of the future, Ward M. Canaday, assistant FHA administrator, told the Michigan Society of Architects recently.

"You can no longer think only of efficient heating," said Mr. Canaday. "You must think of efficient air conditioning. There is no reason why a $5,000 home shouldn't have it. You must think of automatic heating, mechanical refrigeration, insulation, and the designing of homes that will reduce upkeep to the minimum."

Iowans Migrate to Air-Conditioned Hotel Maytag

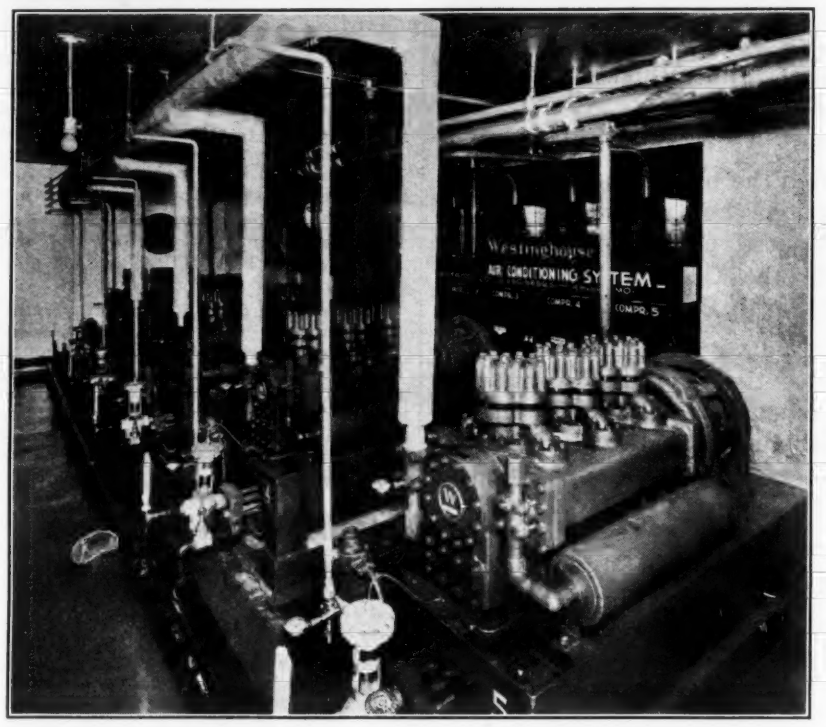
NEWTON, Iowa—Summer migration from town to cottage and country resorts is an annual American practice, but for whole families to turn off their electric refrigerators, lock up the house, and take their baggage to a local air-conditioned hotel to ward off hay fever, and to evade the extra warm days, deserves headlines in any vacation travel story, believes E. W. Zeug, manager of the Hotel Maytag here.

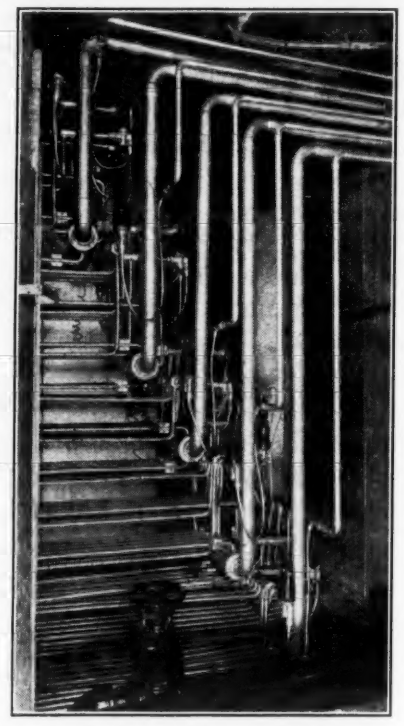
"Since our hotel has been air conditioned throughout with Frigidaire equipment, it has become a virtual Mecca for those affected by late summer heat, humidity, and the plant pollens which cause hay fever," Mr. Zeug explained.

Six families, members of which are victims of hay fever, are now guests in the Maytag, Mr. Zeug stated. Manager Zeug has added an extra typist to his staff to care for the many inquiries from prospective guests, and from hotel operators all over the country who seek information on offering air conditioning to the public in hotel promotions.

"We tell them," said Mr. Zeug, "what our guests tell us—that they sleep better here than they possibly could at home. We consider the purchase of air-conditioning equipment the best investment we have made."

Installation of Coils & System of Controls Feature This Job





The battery of Westinghouse compressors which were installed to air condition the Lincoln theater, Lincoln, Neb., is shown at the left, while the Fedders coils and expansion valves are at the right.

New Apartment Built Of Glass Bricks to Be Air Conditioned

NEW YORK CITY—Air conditioned throughout, and with an exterior of glazed blue and glass brick, a new five and one-half story apartment house building nearing completion at 219 East 49th St., will present an example of applied modern scientific contributions to comfort, with freedom from noise and dirt, controlled air conditions, and effective lighting.

That air conditioning was his first consideration in planning the house, and that all other factors were built around it, is the contention of Morris B. Sanders, architect and industrial designer, who designed the apartment, and who will maintain his studio on the ground floor, and occupy the seven-room apartment on the upper two and a half floors.

Two Systems Being Installed

Two General Electric systems will provide year-'round air conditioning, and a G-E furnace is being installed. Both indoor and outdoor air will be mixed in conditioners located in the basement. In them, air will be filtered, heated, and humidified in the winter; filtered, cooled, and dehumidified in summer, and circulated through the house by a duct system. Electric controls will automatically regulate the heating and air circulating.

Foil insulation on outside walls, and dehydrated double glass windows and doors, will abet the air conditioning in eliminating noise and dirt.

Internal Features of Building

Internal features include both indirect lighting and direct lighting by lumaline bulbs; living rooms and bedrooms each equipped with a fireplace, built-in furniture, and great amounts of natural light admitted through glass brick walls.

Corning-Steuben vacuum construction units of Pyrex glass bricks, which form wall sections in this building, are being used for the first time in New York. Each four inch thick unit occupies a square foot of wall surface, and each unit is a complete homogeneous piece of glass.

Insulation of Brick

The degree of vacuum on the blocks makes condensation impossible on the inside of the block, and gives a high insulation value. Reflection of radiant heat from the surface also contributes to the insulating properties. Heat loss is estimated at less than that through an eight inch brick wall.

Air-conditioning systems are installations of the Schwerin Air Conditioning Corp., New York City dealer for G-E air-conditioning equipment.

Bricks Shed Dirt

Externally the building claims attention with its facade of roval blue glazed brick, which sheds dirt and does not show the effects of weather. Vacuum glass brick forms the entire front wall of each floor.

Glass walls of the ground floor studio, and of the living rooms on the second and fourth floors will be set back, and the straight front broken with vine and flower banked loggias, containing built-in flower boxes.

Casement windows on the third and fifth floors, and doors to the loggias will be double glazed, with a dehydrated air space between the panes, to insulate the building against noise, dirt, and weather. They will be framed in aluminum. This glass brick treatment will be carried out also in the rear of the house.

Accurate Temperature Control Is Employed In Theater System

LINCOLN, Neb.—Accurate and automatic control of temperatures marks the installation of air-conditioning equipment made for the Lincoln theater here by Natkin & Co., Kansas City engineering firm.

Westinghouse compressors and Fedders evaporators were employed.

The system maintains a 76° F. dry bulb temperature and 45 per cent relative humidity with outside conditions of 100° F. dry bulb and 75° F. wet bulb.

Fedders air-conditioning coils having 100 tons capacity are fed by five 25-hp. model RW-705 Westinghouse compressors. Refrigerant control is by Fedders high capacity thermostatic expansion valves.

The Fedders manifolding system is used in the distribution of refrigerant throughout all sections of the coils.

In starting the air-conditioning equipment it is only necessary to turn on two switches located in the manager's office on the mezzanine floor; one controlling the blower, and the other the refrigerating machines.

The control is furthermore arranged so that the machines start in progression, as the load increases. Also provided in this step of the control is a reversal of the cycle of operation of the compressors every 12 hours, so that each machine operates the same length of time.

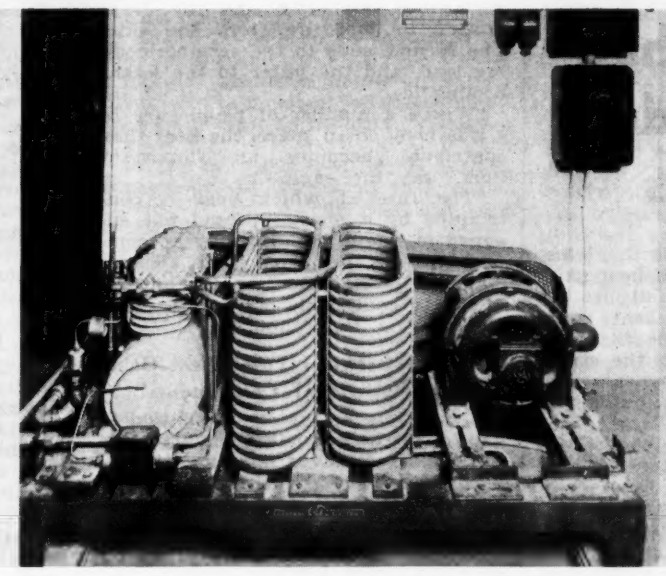
A time clock in the control system automatically stops the entire plant every seven days as a warning that the system must be oiled.

G-E Conditioners Put On Exhibition at N. Y. Radio Show

NEW YORK CITY—Because G-E executives believe that air conditioning is reaching a new peak in sales and public interest this year, the air-conditioning department of the General Electric Co. exhibited its entire line of air-conditioning equipment at the National Electrical & Radio Exposition held here last week and this week (Sept. 18-28). In other years, smaller displays of equipment were shown alongside of products of other divisions of the company.

Equipment, ranging from single room units to complete year-'round central systems, included the following: a room cooling unit which operates on an ordinary 110-volt a.c. lighting current, eliminating the need for special power supply, and for water supply and drain connections; a direct-fired warm air conditioner, combining in one unit equipment for automatic oil heating and winter air conditioning for a six-room house; and several illuminated exhibits with cut-away sections and glass panels to reveal the operating mechanism.

Air Conditioning Has Many Functions in N. Y. Milliner's Wholesale House



(1) The showroom of Mademoiselle Germaine, New York City wholesale milliner, was recently conditioned by General Electric. Note grilles over doorways at right. (2) Refrigeration is provided by this 10-hp. G-E compressor. The system circulates 4,000 cu. ft. of air per minute. (3) The workshops were also air conditioned in Mademoiselle Germaine's millinery.

* * *

System in Wholesale Milliner's Provides Comfort for Buyers & Employes, Preserves Hat Materials

NEW YORK CITY—Mademoiselle Germaine, metropolitan wholesale milliner, believes that her new air-conditioned quarters at 711 Fifth Ave., will not only provide comfort for her customers, models, and workers, but will bring about more efficient handling of velvets and other materials which become sticky in humid atmospheres.

The General Electric air-conditioning system provides refrigeration equivalent to an ice melting effect of 10 tons of ice in 24 hours. The system distributes 4,000 cu. ft. of air per minute, of which one-fourth is outside air, to the showroom, office, models' room, designing rooms, and the main workshop. The cooled, cleaned, dehumidified air is circulated through concealed ducts and delivered through grilles.

The system will provide comfort for buyers, who sit for several hours at a time in the showroom, ease for models throughout the day, and cool comfort for the 100 or more people employed in the workrooms during the hottest part of the summer, when advance activity on fall hats is heavy.

Mademoiselle Germaine expects this provision for comfort and health will increase employee efficiency and reduce the usual toll of illness and work loss through heat fatigue.

The system was installed by the Schwerin Air Conditioning Corp., New York dealer for G-E air-conditioning equipment. The installation is claimed to be the first in the country in an establishment of this kind.

Kelvinator Develops 3 Oil-Burner Boilers

DETROIT—Three new oil-burning boiler units—designed for homes and commercial buildings—have been added to Kelvinator Corp.'s line of automatic heating equipment, which includes three conversion-type oil burners and two boiler-burner units. If year-'round air conditioning is desired, additional equipment for cooling in summer may be installed.

The new units may be used for steam, vapor, or hot water heating systems. Each unit combines a sectional cast iron oil-burning boiler, water heater, and automatic controls.

Designated as models KB-3, KB-4, and KB-5, the new units provide total heat radiation of 780, 1,230, and 1,635 sq. ft., respectively, for steam and 1,170, 1,845, and 2,450 sq. ft. for hot water. Each unit has moulded combustion chambers which conform to the size and shape of the flame, and extended ribs to provide rapid transfer of heat from the combustion chamber to the water-leg of the boiler.

A built-in water heater in each unit provides 100 gals. of water, raised 100° in temperature, in three hours. Sectional design permits installation without altering stairways or doors.

Air Conditioning Plays New Role as Waiters' 'Jitter-Eliminator'

LONDON, England—Air conditioning as a jitter-eliminator and nerve-soother, has increased efficiency, given customers greater comfort, and lessened the amount of dish breakage in the Trocadero restaurant, one of the chain of restaurants, tea rooms, and hotels operated by J. Lyons & Co., Ltd., here, says W. Buchanan Taylor, company executive.

Since this company had the Trocadero equipped with an air-conditioning system that filters the air and controls the temperature and humidity, the number of patrons visiting the grill room has increased by 30 per cent, Mr. Taylor states.

Waiters worked so well in the suitable temperature maintained in the grill during the recent heat wave, that breakages were greatly reduced, and service increased in speed, he affirms.

Wilkinsburg Development Features Conditioning in Moderate Homes

WILKINSBURG, Pa.—First real estate development in the Pittsburgh territory to feature year-'round air conditioning for moderately priced homes has been undertaken here by F. G. Bischoff, Braddock, Pa., food and produce merchant.

Convinced of the advantages of year-'round air conditioning, through the use of York equipment in his office for the past two years, Mr. Bischoff purchased an 80-acre tract along William Penn Highway, a short distance above Wilkinsburg, and erected there the first of a group of small, model homes, each equipped with a complete central air-conditioning system.

The homes will be in the $7,000 to $8,000 price range, including the cost of the air-conditioning equipment. Each will include an acre of ground, the front of which, extending from the house to William Penn Highway, will be devoted to a park, including a swimming pool.

Advertising the tract on a large billboard along the highway, Mr. Bischoff has listed year-'round air conditioning as the leading feature.

First of the homes, occupied by the Bischoff family, has 5,200 cu. ft. of conditioned space, served by a York 1½-hp. Freon water-cooled condensing unit, connected with a York standard air conditioner and built into a Waterbury Seamless furnace in the basement.

From this point, the necessay duct-work distributes cooled, conditioned air to every room in the house in summer, and warmed and humidified air during the winter. Cost of the cooling system was approximately $745.

In the second model home, the "zone system" of central plant air conditioning was tried out. It was found that, although the second home was larger than the first, having 7,300 cu. ft. of conditioning space, it could be handled properly with a 1-hp. condensing unit using zone control, whereas the first home required a 1½ hp. unit.

Operating conditions in both homes are practically the same, the unit for the second house being installed in a Pennsylvania furnace, and connected with a standard York air-conditioning coil.

Zone control in the second home, however—that is, arranging the central system to cool the living and dining rooms during the day time, and the bedroom at night—effected a considerable saving in operating the system, Mr. Bischoff found. This was in addition to the saving in initial cost.

AIR CONDITIONING

G-E Engineers Devise Method Of Determining Magnitude Of Cooling Load Factors

SCHENECTADY—New data on factors which affect the cooling load, and a systematic and rational method for accurately determining its character and magnitude, have been developed by F. H. Faust, L. Levine, and F. O. Urban, engineers of the General Electric air conditioning department.

Scientific application of air-conditioning equipment, say these engineers, requires that such equipment shall have adequate capacity to maintain specified indoor conditions, but that the margin of capacity over what is required shall not be so great as to make the installation economically unjustifiable. Thus the first step in an application is to determine the maximum cooling effect which is necessary, and the second step is to select equipment which is capable of producing this required cooling effect both economically and with a degree of flexibility necessary to meet varying conditions of operation.

In their study, the G-E engineers present a heat gain calculation sheet which suitably organizes and tabulates the work in a minimum of space.

The heat gain method to be described presents certain features of advantage to the user, namely;

1. It is applicable to any kind of an enclosure, ranging from a single room to a complete building.
2. It saves time required for making the calculations.
3. It minimizes the chances of error by systematizing the work and providing suitable calculation form.
4. It permits the engineer to select equipment of adequate capacity, without unnecessary margins, by tabulating accurately each component of the cooling load.
5. It permits the engineer to select the type of control necessary for providing flexibility to meet all conditions of operation by indicating the load components and the manner in which they vary.

The manner in which this method provides the benefits summarized will become apparent in the course of the description.

Components of Heat Gain

The cooling load is composed of five different components:

1. Heat conducted through walls, windows, etc.
2. Heat absorbed from radiations of the sun.
3. Heat generated by lights and appliances, and other miscellaneous sources.
4. Heat brought in by outdoor air.
5. Heat liberated by people.

The components of heat gain, classified by source, may be further classified as sensible and latent heat gain. The first two components fall into the classification of sensible heat gain; that is, they tend to raise the temperature of the air within the structure. The last three components also produce sensible heat gain, but in addition they may produce latent heat gain; that is, they may tend to increase the moisture content of the air within the structure. Each component is discussed briefly below.

Heat is conducted through walls and partitions because the temperature of the air within the air-conditioned space is lower than that on the opposite side of the wall. This is the same process as that by which heat is lost through walls in winter.

Heat absorbed from radiations of the sun increases the cooling load in two ways. In the first place, the sun transmits invisible, but intense, heat rays which increase the temperature of all surfaces exposed to them. With this higher temperature, more heat is conducted to the interior of the structure than if the walls were not exposed to the sunshine.

In the second place, the heat rays of the sun pass almost undiminished through ordinary window glass which is exposed to them.

Temperatures of flat roofs have been observed to rise as high as 180° F. on a bright summer day, 75 to 80° above the temperature of the air. The heat conduction into top floor rooms may be more than doubled because of this effect.

Similarly, glass windows exposed to the sun may allow as much as 90 per cent of the incident heat to pass through, and it is not uncommon for this portion of the cooling load to be more than the total conduction through the wall proper.

Heat is generated by energy consuming appliances within the air-conditioned space, such as electric lights, motors, coffee urns, steam tables, etc. Some of the appliances, such as electric lights and motors, produce only sensible heat gain. Other appliances, such as coffee urns, produce both sensible and latent heat gains.

Latent heat gains may arise from the evaporation of moisture within the appliance, or from the liberation of moisture as a product of combustion where a gas flame is present.

Heat gain results from the incoming outdoor air, which may be introduced by natural, uncontrolled infiltration or by controlled ventilation. This is both sensible and latent in character, as outdoor air entering the structure may have to be both cooled and dehumidified.

Heat is liberated by people through convection and radiation from the surface of the body, and the evaporation of moisture from the skin. The former adds to the sensible cooling load, and the latter to the latent cooling load.

"Where a number of people are in a relatively small space, the heat they contribute becomes an important item," say the engineers.

"The rate at which heat is contributed by a normal person not engaged in undue activity may be compared to the absorption of an average domestic refrigerator, or to that required to completely boil away a pint of water in three hours."

Relation Between Total Heat Gain and Individual Components

A complete heat gain calculation to determine the maximum requirements for cooling involves not only the independent calculation of each of the various components, but it involves also the proper combination of these components to determine the correct maximum heat gain.

Each individual component varies in magnitude from hour to hour during the day and reaches a maximum or peak value at some particular time. However, the individual maximums do not necessarily occur simultaneously, so that the maximum total heat gain actually may be less than the sum of the maximum values of the several components.

Variations in the heat conducted through walls, and the sensible heat of ventilation air result from changes in the temperature of the outdoor air.

In considering conduction through walls exposed to the sun, the intensity of the solar heat striking a wall depends on the angle between the wall and the rays of the sun. This intensity is greater when the rays of the sun are most nearly perpendicular to the wall, and hence the progression of the sun from east to west causes a variation in this component of the heat gain.

Similar is the variation in heat gain from solar heat passing directly through windows.

Latent heat of ventilation air shows no variation. This will be discussed later.

The total heat gain, taken from the curves of the components discussed above, worked up in a calculation for a group of offices, is obtained by adding each of the componets in the proper phase relation. Whereas individual components attain maximum values at 8 a. m., 10 a. m., 2 p. m., 3 p. m., and 4 p. m., respectively, the total heat gain is a maximum at 4 p. m.

"Clearly it would not be accurate (though it would be conservative) to find the greatest value that each component attains during the day, and then to add all the maximum values together to find the maximum total gain," report the engineers.

"Difference between the results obtained by adding the maximum values of the individual components, and combining those components at the time of day when the total is maximum, may be as much as 20 per cent, or as little as 5 per cent."

The method of calculation described here is sufficiently flexible to permit taking account of the fact that when one component is at its peak, others may have either passed or not yet reached their peak values. The introduction of this element of additional accuracy and flexibility requires that the calculations be made for a predetermined time of day in each case. The method of predicting the correct time of day will be described later.

Design Conditions

The following design conditions used in making a heat gain calculation affect the magnitude of the cooling load:

1. Outdoor air
   (a) Dry-bulb temeprature
   (b) Vapor density
2. Indoor air
   (a) Dry-bulb temperature
   (b) Vapor density
3. Weight of outdoor air entering the enclosure.

Conditions of the indoor air are fixed by the dry-bulb and wet-bulb temperatures which are specified according to the requirements of the application.

The amount of ventilation air is specified according to the requirements of the application if ventilation is controlled. Otherwise it is determined by the infiltration rate.

Design outdoor conditions are based on the Weather Bureau records of the locality under consideration. The design outdoor dry-bulb temperature is usually specified as a maximum value. This design temperature for comfort applications may be selected so that it will be exceeded by not more than about 90 per cent of the daily maxi-

(*Continued on Page 17, Column 1*)

Figure 1

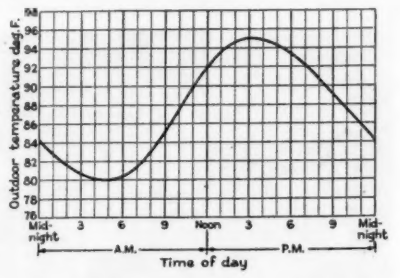


Fig. 1—Chart showing variation in outdoor temperature plotted from weather bureau reports.

Figure 2—Heat Gain Calculations Sheet

Name ..... Room used for..... Job No. .....

Street ..... Room No.....Floor..... Sheet No. .....

City ..... Calculated by ..... Date .....

DESIGN CONDITIONS

Outdoor: D.B. Temp.....°F. W.B. Temp.....°F. Abs. Hum.....Gr. per lb. Calculations are for.....a.m. p.m.

Indoor: D.B. Temp.....°F. W.B. Temp.....°F. Abs. Hum.....Gr. per lb. Volume of room.....cu. ft.

Temp. Diff. .....°F. Hum. Diff.....Gr. per lb. Infiltration rate.....c.f.m.

Ventilation Air, Required Amount.....c.f.m. (at indoor design conditions).

SENSIBLE HEAT GAIN

Column	I	II	III	IV	V	VI	VII	VIII	IX	
Side	Direction Wall Faces	Wall or Partition Dimensions Windows and Doors, Number and Dimensions	Gross Wall Area sq. ft. Total Glass Area sq. ft. Net Wall Area sq. ft.	— Ug Uw	Design D.B. Temp. Diff. °F.	Conduction from Temp. Diff. Btu per hr. IIIxIVxV	Calculation of Rw for VIII Rw=FxAxI F A I	— Rg Rw	Sun Effect Btu per hr. IIIxVIII	REMARKS
1st										
2nd										
3rd										
4th										
5th										
Ceiling										
Floor										

Total Sun Effect.....

Conduction: Time Corr. Factor, T, (.....) x Sum of Col. VI (.....) =.....B.t.u. per hr.

Vent. air: Time Corr. Factor, T, (....)xTemp. diff.(....)xc.f.m.(....)x1.04=.....

Sun effect: Sum of Col. IX ..... =.....

People: No. of persons in room (....) x B.t.u. per hr. per person (.....) =.....

Electrical appliances: Watts (.....) x 3.4 ..... =.....

Other sources: B.t.u. per hr..... =.....

Total Sensible Heat Gain (Without window shading)..... =.....**B.t.u. per hr.**

Savings from awnings or shades: sun effect(....) x shading factor (....) = Total glass .....

Total Sensible Heat Gain (With window shading)..... =.....**B.t.u. per hr.**

LATENT HEAT GAIN

Ventilation air: C.f.m. (.....) x Hum. diff. (.....) x 0.66 ..... =.....B.t.u. per hr.

People: No. of persons in room (.....) x B.t.u. per hr. per person (.....) =.....

Other sources: Lb. of water per hr. (.....) x 1060 ..... =.....

Total Latent Heat Gain ..... =.....**B.t.u. per hr.**

Total Sensible Heat Gain ..... =.....

TOTAL HEAT GAIN =.....**B.t.u. per hr.**

EXPLANATIONS

U—Transmission Coefficient.
R—Solar Radiation Coefficient.
I—Intensity of Sun.
A—Absorption Coefficient.
F—Radiation Factor.
w—(subscript)—Wall.
g—(subscript)—Glass.

See Engineering Data Book for coefficients and factors.

Heat from People, B.t.u. per hr. per person:
Average condition (at rest, eating, office work, etc.)
Sensible 220
Latent 180
Medium rate of exertion (restaurant waiters, average dancing, etc.)
Sensible 230
Latent 420

Effect of Design Conditions and Sun On Air-Conditioning Load

(*Continued from Page 16, Column 5*)

mum outdoor temperatures during the cooling seasons over a period of several years.

Systems designed on the basis of such an outdoor temperature will, on occasional extreme days, be incapable of maintaining normal indoor conditions, but will be generally satisfactory, considering both performance and investment. Recommended values are given in Chapter 8 of *The A. S. H. V. E. Guide*.

The design outdoor temperature described is really the design maximum outdoor temperature. As has already been described, the maximum total heat gain may occur at some time of day when the outdoor temperature is considerably lower than its maximum value. A night club is an outstanding example of an application in which this condition arises.

Hence, it is necessary to know not only the design maximum outdoor temperature, but also how the outdoor temperature varies from hour to hour, and how far it may have dropped by evening following a maximum day.

A careful study of Weather Bureau data indicates that for practical purposes the outdoor temperature may be assumed to vary in the manner shown by Fig. 1. It has been found that on the average the outdoor temperature is highest about 3 p. m., and lowest about 5 a. m.

The difference between the maximum and minimum outdoor temperatures on a *maximum* day may be taken as the mean difference between the daily maximum and daily minimum outdoor temperatures for the month of July. This mean difference is termed by the Weather Bureau the *mean daily range* for July. It varies from about 10° F. in some parts of the United States to about 40° F. in other localities.

A table of outdoor temperatures for various hours of the day may then be constructed by using the formula:

$$to = td - B\ V \qquad (1)$$

where

to = design outdoor temperature at a particular time of day.

td = design maximum outdoor temperature.

V = mean daily range for July.

B = an hourly factor, determined by the shape of the curve in Fig. 1, and tabulated in Table 1.

Table 1 shows design outdoor temperatures, calculated as outlined above, for various hours of the day in a locality where the design maximum outdoor temperature is 95° F. and the mean daily range for July is 15° F. Of course there are occasional days when the temperature range is less than the mean value, and the temperature is somewhat higher in the evening than is indicated by the above analysis. This possibility should be kept in mind.

It was implied previously that the latent heat gain of ventilation air is substantially constant for various hours of the day. A study of Weather Bureau Data shows that in general the outdoor relative humidity is lowest when the outdoor dry-bulb temperature is highest, and vice versa. Furthermore, this variation in outdoor relative humidity is of such a nature that the vapor density, or moisture content, of outdoor air is approximately constant.

Consequently, the outdoor vapor density may be determined from the psychrometric chart once the design maximum outdoor dry-bulb and wet-bulb temperatures are known.

Design outdoor wet-bulb temperature may be selected on the same basis as the design outdoor dry-bulb temperature; that is, high enough so that it will include about 90 per cent of the daily maximum wet-bulb temperatures during the cooling season.

Outdoor vapor density is not exactly constant during the entire day, and of course shows sharp variations during stormy periods. The assumption of a constant design outdoor vapor density on a *maximum* day, however, is reasonably accurate for comfort applications. It must be recognized that all assumptions in regard to climatic conditions are of necessity approximate.

Time Lag Resulting from Heat Storage

The heat storage capacity of walls results in a phenomenon akin to a time lag in the flow of heat through them. The result is that the maximum effects of outdoor temperature and solar radiation may not manifest themselves on the interior until some time after the actual maximum outdoor conditions have passed. This introduces the problem of determining time lag, which will be discussed later.

The following sections of this article will be devoted to methods of determining accurately the character and magnitude of the components of the heat gain, and of combining them properly to predict the total cooling load.

Calculation of the Components of Heat Gain

Heat Gain Calculations Sheet

A calculation sheet for organizing and tabulating the calculations described in the following paragraphs is shown in Fig. 2.

Conduction From Temperature Differences

The technique of calculating heat conduction through a wall is well known and widely used in determining heating requirements for winter. The heat gain by conduction is calculated from the formula:

$$Hc = Aw\ Uw\ (to - ti) \qquad (2)$$

where

Hc = heat conducted through the wall, window or other partition, B.t.u. per hour.

Aw = Area of wall, window, etc., sq. ft.

ti = design indoor temperature, F.

to = design outdoor temperature, F.

Uw = overall coefficient of heat transmission of the wall, window, etc., B.t.u. per hour per sq. ft. per F.

A complete discussion of the transmission of heat through walls, etc., is given in The A.S.H.V.E. Guide, Chapter 5, together with transmission coefficients for walls of various types of building construction.

In making this calculation, care must be exercised to consider separately each section of the wall having different overall heat transmission coefficients or different temperature differences.

For example, the overall coefficient for a window is different from that for the wall in which it is located. This is taken care of automatically on the calculation sheet.

Careful judgment must be exercised in selecting temperature differences. Thus, the value for outside walls is equal to the difference between the design outdoor temperature and the design indoor temperature, while the temperature difference across inside partitions may be greater or less.

For inside partitions, with no unusual sources of heat on the far side, it is justifiable to assume temperature differences from 3 to 5 degrees less than for outside walls, at that time of day when the outdoor temperature is highest.

If the partition adjoins a hot kitchen, or other similar heated space, it is desirable to assume a temperature difference somewhat greater than for the outside walls.

Sun Effect Through Walls

The heat absorbed from solar radiation falling on exposed surfaces has already been discussed briefly. The actual process that occurs can be explained simply.

The amount of heat received by each square foot of wall surface depends upon the intensity of the solar heat and the angle between the surface and the rays of the sun. However, a part of this heat is reflected directly back into space without affecting the temperature of the wall surface, because all surfaces act as heat mirrors to a greater or lesser extent.

The nature of the outside surface of the wall determines its effectiveness as a heat mirror, and thus is an important factor in determining how much of the incident solar heat penetrates the wall and adds to the cooling load.

Of the heat absorbed by the outside surface of the wall, a portion is dissipated to the outside air and surroundings by convection and radiation and the balance is conducted through the wall into the air-conditioned space.

Actual *total* amount of heat conducted through a wall exposed to the sun depends not only on the amount of solar heat which is absorbed by the outside surface but also on the overall heat transmission coefficient, and the temperatures of the indoor and outdoor air. A mathematical expression for the heat balance involved shows that the total heat conducted to the interior may, for practical purposes, be expressed by,

$$Ht = Aw\ Uw\ (to - ti) + Aw\ Rw \qquad (3)$$

The first term of (3) is identical with (2). The second term is

$$Hr = Aw\ Rw \qquad (4)$$

where

Hr = Additional heat conducted through a wall exposed to the sun, B.t.u. per hour.

$$Rw = F\ a\ I \qquad (5)$$

I = Actual solar radiation striking the wall, B.t.u. per hour per sq. ft.

a = Percentage (expressed as a decimal) of the incident solar radiation which is absorbed by the wall surface.

F = Percentage (expressed as a decimal) of the absorbed solar radiation which is transmitted to the inside.

It will be noted in (3) that the total conduction through a wall includes two additive terms. The first one is identically the same as that given above for heat conducted through a wall not exposed to the sun. The second term depends only on the intensity of the sun and the characteristics and orientation of the wall, and is independent of the temperature difference across the wall.

Thus, equation (4) gives the *additional conduction* through walls exposed to the sun.

The radiation factor Rw, depends on I, the amount of solar heat incident on the wall; a, the absorption coefficient of the wall; and F, a factor which gives the percentage of the absorbed solar heat which is transmitted to the interior.

The intensity of solar radiation, I, on a given wall, depends on the amount of water vapor and dust in the atmosphere through which the solar heat must travel before it reaches the surface.

Table 2 gives values of I for surfaces facing different directions, at different hours of the day and for several northern latitudes. These values of I take into account the average amount of water vapor and dust in the atmosphere throughout the United States, and are applicable for the period of the year during which the heat gain is normally a maximum, namely, from early May to the middle of August.

Average values of the absorption coefficient, a, are given in Table 3. The factor F depends on the overall transmission coefficient, Uw of the wall. Values of this factor are determined from the curve of Fig. 3.

It should hardly be necessary to point out here that the calculations of sun effect through walls described above are made only when the walls are definitely exposed to the sun. If the wall is shaded by trees or other buildings, there will be no heat from the sun striking it directly, and the calculation of this component of the heat gain is omitted.

When the wall is only partly shaded, it will be necessary to estimate, or calculate from the geometry involved what percentage of the wall is thus protected, and to make allowances accordingly.

The method of calculating sun effect through walls described in this paper makes possible an accurate and scientific determination of this component. Fundamentally, this method is equivalent to calculating the temperature differences across walls exposed to the sun, and avoids the necessity for estimating them.

The mathematical elimination of the wall surface temperature, however, results in the simple expressions given by equations (3), (4), and (5).

Furthermore, when the above method is used in conjunction with the proper combination of the several components, sun effect is included for only those walls exposed to the sun when the total cooling load is a maximum.

Sun Effect Through Windows

Transparent windows present a problem somewhat different from that of opaque walls, because they permit a large percentage of the solar energy to pass through undiminished.

The actual amount of incident energy which is transmitted depends on the actual transparency of the window glass to the solar heat rays and on the angle between the rays and the surface of the glass.

That is, the amount of heat reflected by the exterior surface of the glass depends upon the angle between the glass and the rays of the sun. An ordinary window glass which is exactly perpendicular to the rays of the sun actually permits about 90 per cent of the energy to pass through unobstructed.

The heat gain through windows exposed to the sun is calculated by the formula:

$$H'r = Ag\ Rg$$

where

$H'r$ = solar radiation transmitted through a window, B.t.u. per per hour.

(*Continued on Page 18, Column 1*)

Table 1—Design Temperatures

TABLE 1—Design Outdoor Temperatures for Various Hours of the Day (td = 95° F.; V = 15° F.)

Hourly Factor B	BV	Design Outdoor Temperature (to = td − BV)	Time of Day
0.8	12.0	83	1 a.m.
0.9	13.5	82	2
0.95	14.2	81	3
1.0	15.0	80	4
1.0	15.0	80	5
1.0	15.0	80	6
0.9	14.2	81	7
0.8	12.0	83	8
0.65	9.8	85	9
0.5	7.5	88	10
0.3	4.5	91	11
0.2	3.0	92	Noon
0.1	1.5	94	1 p.m.
0	0	95	2
0	0	95	3
0	0	95	4
0.05	0.75	94	5
0.1	1.5	94	6
0.2	3.0	92	7
0.3	4.5	91	8
0.4	6.0	89	9
0.5	7.5	88	10
0.6	9.0	86	11
0.7	10.5	85	Midnight

AIR CONDITIONING

Table 2—Coefficients of Sun Effect

TABLE 2—Sun Effect Coefficient at Various Latitudes for Walls Facing Several Directions

Coefficient	Time of Day	Ne	E	Se	S	Sw	W	Nw	Horizontal Surface
				30° North Latitude					
I	6 a.m.	125	135	65	..	..	..	..	25
	7 a.m.	165	195	110	..	..	..	..	80
	8 a.m.	160	210	135	..	..	..	..	150
	9 a.m.	125	185	140	10	..	..	..	210
	10 a.m.	75	135	120	30	..	..	..	255
	11 a.m.	20	70	85	45	..	..	..	285
	Noon	..	..	35	50	35	..	..	295
	1 p.m.	..	..	..	45	85	70	20	285
	2 p.m.	..	..	..	30	120	135	75	255
	3 p.m.	..	..	..	10	140	185	125	210
	4 p.m.	..	..	..	..	135	210	160	150
	5 p.m.	..	..	..	..	110	195	165	80
	6 p.m.	..	..	..	..	65	135	125	25
Rg	6 a.m.	115	125	50	..	..	..	..	10
	7 a.m.	150	180	95	..	..	..	..	60
	8 a.m.	140	190	115	..	..	..	..	125
	9 a.m.	95	165	110	..	..	..	..	190
	10 a.m.	45	110	90	10	..	..	..	235
	11 a.m.	..	40	55	20	..	..	..	260
	Noon	..	..	10	20	10	..	..	270
	1 p.m.	..	..	..	20	55	40	..	260
	2 p.m.	..	..	..	10	90	110	45	235
	3 p.m.	..	..	..	..	110	165	95	190
	4 p.m.	..	..	..	..	115	190	140	125
	5 p.m.	..	..	..	..	95	180	150	60
	6 p.m.	..	..	..	..	50	125	115	10
				35° North Latitude					
I	6 a.m.	135	145	70	..	..	..	..	30
	7 a.m.	160	200	120	..	..	..	..	85
	8 a.m.	150	210	145	..	..	..	..	150
	9 a.m.	110	185	150	30	..	..	..	205
	10 a.m.	60	135	135	55	..	..	..	250
	11 a.m.	..	70	100	70	..	..	..	280
	Noon	..	..	55	75	55	..	..	290
	1 p.m.	..	..	..	70	100	70	..	280
	2 p.m.	..	..	..	55	135	135	60	250
	3 p.m.	..	..	..	30	150	185	110	205
	4 p.m.	..	..	..	..	145	210	150	150
	5 p.m.	..	..	..	..	120	200	160	85
	6 p.m.	..	..	..	..	70	145	135	30
Rg	6 a.m.	120	135	55	..	..	..	..	15
	7 a.m.	145	185	100	..	..	..	..	65
	8 a.m.	130	190	125	..	..	..	..	130
	9 a.m.	85	165	125	..	..	..	..	185
	10 a.m.	30	110	105	25	..	..	..	230
	11 a.m.	..	40	70	40	..	..	..	255
	Noon	..	..	25	45	25	..	..	265
	1 p.m.	..	..	..	40	70	40	..	255
	2 p.m.	..	..	..	25	105	110	30	230
	3 p.m.	..	..	..	..	125	165	85	185
	4 p.m.	..	..	..	..	125	190	130	130
	5 p.m.	..	..	..	..	100	185	145	65
	6 p.m.	..	..	..	..	55	135	120	15
				40° North Latitude					
I	6 a.m.	140	155	80	..	..	..	..	35
	7 a.m.	160	200	125	..	..	..	..	90
	8 a.m.	140	210	155	10	..	..	..	150
	9 a.m.	100	185	160	45	..	..	..	200
	10 a.m.	40	135	150	75	..	..	..	240
	11 a.m.	..	70	115	95	15	..	..	270
	Noon	..	..	70	100	70	..	..	280
	1 p.m.	..	..	15	95	115	70	..	270
	2 p.m.	..	..	..	75	150	135	40	240
	3 p.m.	..	..	..	45	160	185	100	200
	4 p.m.	..	..	..	10	155	210	140	150
	5 p.m.	..	..	..	..	125	200	160	90
	6 p.m.	..	..	..	..	80	155	140	35
Rg	6 a.m.	130	140	65	..	..	..	..	20
	7 a.m.	145	185	105	..	..	..	..	70
	8 a.m.	120	190	135	..	..	..	..	130
	9 a.m.	70	165	140	20	..	..	..	180
	10 a.m.	15	110	125	45	..	..	..	220
	11 a.m.	..	40	90	65	..	..	..	250
	Noon	..	..	40	70	40	..	..	255
	1 p.m.	..	..	..	65	90	40	..	250
	2 p.m.	..	..	..	45	125	110	15	220
	3 p.m.	..	..	..	20	140	165	70	180
	4 p.m.	..	..	..	..	135	190	120	130
	5 p.m.	..	..	..	..	105	185	145	70
	6 p.m.	..	..	..	..	65	140	130	20

I (For walls and roofs)=B.t.u. per hour striking 1 sq. ft. of wall surface.
Rg (for windows and skylights)=B.t.u. per hour transmitted by 1 sq. ft. of single glass (for double glass multiply values of Rg given above by 0.9).

Effect of Motors & Appliances on Air Conditioning Load

(*Continued from Page 17, Column 5*)

Ag = area of the glass, sq. ft.
Rg = amount of solar heat transmitted directly, through the glass, B.t.u. per hour per sq. ft.

Values of the radiation coefficient, Rg, for windows in walls facing different directions, at different hours of the day and for several northern latitudes are given in Table 3. These values of Rg are based on the values of I given in the same table and the reflective and absorptive characteristics of ordinary window glass at various angles between the solar rays and the glass.

When windows are completely shaded from the sun by trees or other buildings, then none of the solar energy passes through them. If they are partially shaded the percentage reduction must be estimated, or calculated from the geometry involved.

In the absence of such accidental shading, there are various man-made devices such as awnings, shades, and venetian blinds which may be used to mitigate the effect of the sun to a greater or lesser extent.

It is somewhat difficult to give an exact appraisal of the relative effectiveness of these various devices, because as yet complete experimental evidence is not available. However, the matter may be summarized about as follows:

1. Devices hung *inside* the window, such as shades or blinds, are not as effective as devices hung outside. This is because they interrupt the rays of the sun only after they have passed through the glass. Although some of the heat may be reflected back through the glass, a portion of it is absorbed and transmitted into the room.

2. Awnings are probably not so effective on the first floor of a building as they are on upper floors. In the former case the surface of the ground no doubt reflects some of the solar heat through the opening under the awning, and there is secondary radiation from the warm awning itself.

Figure 3

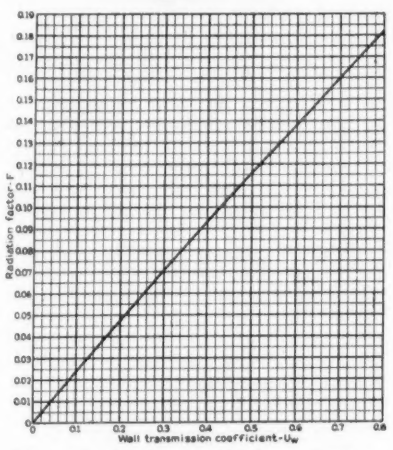


Fig. 3—Solar radiation factor vs. overall wall transmission coefficient.

3. Awnings on the first floor may be assumed to eliminate from the heat gain approximately 75 per cent of the solar radiation which would otherwise pass through the bare windows, and awnings on upper floors may be assumed to exclude 85 per cent of the solar radiation from the window.

4. Inside shades, buff-colored, clean, and completely drawn may be expected to eliminate about 50 per cent of the solar radiation which would otherwise pass through the window. Dark shades are not nearly so effective.

5. Inside venetian blinds with metallic aluminum surfaces, are about as effective as inside buff shades.

Heat from Lights and Appliances

Heat dissipating appliances which give off only sensible heat may be divided into three classes:

1. Those whose electrical watts input are known, or can be read from a nameplate.

2. Those whose electrical watts input may be determined, through brief calculations.

3. Those which have no electrical input.

In the first category may be found such devices as electric lights, toasters, waffle irons, etc., for which the nameplate indicates the electrical power consumption. All of this power is changed into heat and given off to the air in the room. The amount of heat in B.t.u. per hour thus liberated is equal to 3.4 times the watts input (one watt is equivalent to 3.415 B.t.u. per hour).

Under the second heading may be included such devices as motors which show on their nameplate a horsepower rating but do not give the watts input for that rating. If the motor efficiency is known, the watts input may be calculated from the formula:

$$P = \frac{746\ (hp)}{n} \qquad (7)$$

where
P = motor input, watts.
(hp) = motor load, horsepower.
n = motor efficiency (expressed as a decimal).

If there is no way of determining the motor efficiency, then as a fair approximation, the heat gain from such sources may be obtained by using the data in Table 4, multiplying the figures in the table by the motor horsepower rating.

The third class of appliances includes items such as ranges, steam tables, coffee urns, uncovered steam pipes, etc., where no electrical power consumption is involved. For such cases it is necessary to make a direct estimate of the heat gain in B.t.u. per hour. Table 5 gives heat from various types of appliances.

There are some appliances which give off not only sensible heat, but latent heat as well. These will be encountered most generally in industrial applications. Any device which evaporates moisture into the air falls into this category, and the moisture thus evaporated must be included in the calculations. First, calculate the amount of moisture which is evaporated. The latent heat gain from such appliances is then:

$$H_1 = 1060\ M$$

where
H_1 = latent heat of appliance, B.t.u. per hour.
M = rate of evaporation of water, lb. per hour.
1060 = average latent heat of vaporization of water vapor at air-conditioning temperatures.

A pitfall to avoid in this calculation is the inclusion of latent heat from appliances in two different parts of the calculation. Thus, suppose an electric hot plate rated at 500 watts were used to boil water, resulting in the evaporation of a half pound an hour. The total heat dissipated by the hot plate would be $500 \times 3.4 = 1700$ B.t.u. per hour. The latent heat given off would be $0.5 \times 1060 = 530$ B.t.u. per hour. The thing to note is that the 530 B.t.u. is included in the 1700 B.t.u. given off by the hot plate. Thus,

Latent heat from the hot plate = 530 B.t.u. per hour.
Sensible heat from hot plate = 1170 B.t.u. per hour.
Total heat from hot plate = 1700 B.t.u. per hour.

Heat from Ventilation Air

Outdoor air may be introduced to an air-conditioned space either by natural and uncontrolled infiltration or by controlled ventilation. Such ventilation air must be cooled to room temperature and dehumidified to room humidity. The sensible and latent heat gains from ventilation air are determined accurately from the two formulas:

$$Hs = \frac{60\ Q}{v}\ 0.24\ (to - ti) \qquad (10)$$

$$H_1 = \frac{60\ Q}{v}\ \frac{w_0 - w_1}{7000}\ 1060 \qquad (11)$$

where
Hs = sensible heat, B.t.u. per hour.
H_1 = latent heat, B.t.u. per hour.
Q = ventilation air rate, c.f.m.
v = specific volume of ventilation air, cu. ft. per lb. of dry air.
w_0 = vapor density of outdoor air, grains of moisture per lb. of dry air.

For all practical purposes, these formulas can be simplified to:
w_1 = vapor density of indoor air.

$$Hs = 1.04\ Q\ (t_0 - ti) \qquad (10a)$$

$$H_1 = 0.66\ Q\ (w_0 - wi) \qquad (11a)$$

The various terms involved in these two formulas are easily determined. The method of determining the outdoor and indoor dry-bulb temperatures and vapor densities have been described previously under Design Conditions. The quantity of ventilation air, Q, is equal to the specified amount of ventilation air if a ventilation duct leads to the air conditioner. If dependence is placed on natural infiltration to supply outdoor air, Q is the infiltration rate.

Heat from People

The heat given off by persons varies with the degree of activity of the individual and the temperature of the air, as described in Chapter 2 of *The A.S.H.V.E. Guide*.

In most air-conditioning applications people are found in one of two general states of activity—either they are seated or standing at rest, moving about only occasionally (as in a home or office); or they are engaged in brisk activity such as walking or dancing (for example, restaurant waiters or night club patrons).

For all ordinary cases, the values of sensible and latent heat gain in B.t.u. per hour per person as given in Table 6 may be used. Consideration should, of course, be given in all cases to the number of people who fall in one category or another.

Selecting the Time of Day for Calculation

In selecting the time of day for calculations, one must distinguish between two general types of application.

The first class includes all applications which do not have an unusually large and sharply variable heat gain from people or appliances, such as residences, offices, some types of retail shops, etc.

The second class would include all applications which do have a large heat gain from people and appliances, varying sharply at certain hours of the day, such as restaurants, night clubs, theaters, funeral parlors, etc.

Cases in the first category may be handled quite simply and with reasonable accuracy. The time of maximum heat gain in such cases is dependent upon the climatic factors and degree of exposure of the space being air conditioned. It does not depend so much on variables like occupancy and heat producing appliances.

(*Concluded on Page 19, Column 1*)

Table 3—Absorption Coefficients

TABLE 3—Solar Absorption Coefficients (a) for Different Building Materials

Surface Material	Absorption Coefficient (a)
Very Light Colored Surfaces Such As: White stone, very light colored cement, white or light cream-colored paint	0.4
Medium Dark Surfaces Such As: Asbestos shingles, unpainted wood, brown stone, brick and red tile, dark-colored cement, stucco, and red, green, or gray paint	0.7
Very Dark Colored Surfaces Such As: Slate roofing, tar roofing materials, and very dark paints	0.9

Table 4 & 5—Electric Heat Gains

TABLE 4—Heat Generated by Motors and Motor Generators Operating Continuously

Nameplate Rating In Hp.	Heat Gain in B.t.u. Per Hour Per Hp. Rating Connected Load In Same Room	Connected Load Outside of Room
3 to 20	2950	400
⅛ to ½	4250	1700
½ to 3	3700	1150

Motor Generators Nameplate Rating in Kilowatts	Heat Gain in B.t.u. Per Hr. Per Kw. Rating
¾ to 3	2800
3 to 5	1300

TABLE 5—Heat From Appliances

Nature of Appliances	Not Hooded	Hooded and Ventilated
Coffee Urns and Percolators		
1 Gallon capacity	1000	250
2	2000	500
3	3000	750
4	4000	1000
5	5000	1250
10	16000	4000
Dish Warmers per 10 Sq. Ft. of Shelf	6,000	
Restaurant Range—4 Burner and Oven	100,000	
Residence Electric Range		
Small Burner	3,400	
Medium Burner	4,100	
Large Burner	7,700	
Oven	10,200	
Appliance Connection	2,200	
Warming Compartment	1,000	
Residence Gas Range		
Giant Burner	12,000	
Medium Burner	9,000	
Pilot	250	
Oven	1,000 B.t.u. per cu. ft. of oven volume	

G-E Engineers Give Methods of Reducing Amount of Heat Gain

(*Concluded from Page 18, Column 5*)

Because of this it has been possible to make a study of the probable time of maximum heat gain in such cases with various exposures, and reach substantially accurate conclusions beforehand. The results of this study are given in Table 7.

It is not intended that Table 7 should be used blindly. This standard method was worked up on the basis that the rooms under consideration were approximately square; that outside walls were exposed to the sun, and not shaded by other buildings; that outside walls had one or more windows; that the heat from occupants and appliances was small as compared with the heat from other sources.

Consequently, this data does not apply exactly to rooms which do not conform to these conditions, although it is quite correct for rooms which do not deviate too widely from these specifications.

Let us suppose now that there is under consideration a restaurant doing its greatest business at dinner, and therefore having its maximum occupancy between the hours of 6 and 8 p. m. The people would naturally supply a considerable proportion of the total heat gain and would probably control the time of day when the total heat gain is maximum.

Hence, it is not correct to make the calculations for 2 or 3 p. m., and then add the heat gain from occupants which occurs at a later hour.

On the other hand, it would not be quite accurate to make calculations of all components for 6 or 7 p. m., because of a factor which has been mentioned previously, but not discussed, namely, the effect of time lag or retardation of the heat flow through walls.

The correct solution in the case of a restaurant of this nature would be to calculate the heat gain from sun effect through windows, lights, and appliances, ventilation air and occupants at 6 or 7 p. m. (of course, in the particular case being discussed there would be no sun effect through windows at this late hour, and to add to them the conduction through walls and sun effect through walls calculated for about 4 p. m. or earlier.

In case of doubt as to the proper time to use, the following procedure is recommended:

1. Calculate the maximum value which each component attains during the day, assuming that there is no time lag in the heat transmission through walls.

2. Note the hours at which these peaks occur.

3. Consideration should be given to time lag phenomena in walls, in a manner to be discussed later.

4. Select the probable time of maximum total heat gain from an analysis of the above data.

5. Where the economics of the application warrants the additional time required, an hour by hour calculation of the heat gain may be made.

Table 7—Time of Maximum Load

TABLE 7—Time of Maximum Cooling Load for Rooms with Different Exposures

Room Number	Number of Walls Exposed	Exposed Walls				Awnings On Windows: Occupied Space Above	Awnings On Windows: Roof or Attic Above	No Awnings On Windows: Occupied Space Above	No Awnings On Windows: Roof or Attic Above
1	1	N						2 p.m.	2 p.m.
2		NE						2	2
3		E				2 p.m.	2 p.m.	9 a.m.	9 a.m.
4		SE				1	1	10	10
5		S				2	1	1 p.m.	1 p.m.
6		SW				3	2	4	3
7		W				3	3	4	4
8		NW				4	3	5	4
9	2	N	E			2	2	9 a.m.	9 a.m.
10		NE	SE			2	1	9	9
11		E	S			2	1	10	10
12		SE	SW			3	2	3 p.m.	3 p.m.
13		S	W			3	2	3	3
14		SW	NW			3	3	4	4
15		W	N			3	3	4	4
16		NW	NE			4	3	5	5
17	3	W	N	E		4	3	4	4
18		NW	NE	SE		3	3	4	4
19		N	E	S		2	2	10 a.m.	10 a.m.
20		NE	SE	SW		3	2	3 p.m.	3 p.m.
21		E	S	W		3	2	3	3
22		SE	SW	NW		3	3	4	4
23		S	W	N		3	3	4	4
24		SW	NW	NE		4	3	4	4
25	4	S	W	N	E	3	2	3	3
26		SW	NW	NE	SE	3	2	4	4
27	None							2	2

Effect of Heat Storage in the Walls

Actually, in a great many cases the effect of heat storage in walls may be ignored without creating a serious error in the calculations. Whether this effect may or may not be ignored depends largely on the relationship between the magnitudes of the conduction and sun effect through walls and the other components of the heat gain.

If the two former components are predominant, then it may be desirable to take account of the effect of heat storage. On the other hand, if these two components are small as compared with the rest of the heat gain, the neglect of heat storage phenomena will produce no serious error.

The method of calculating conduction and sun effect through walls, described, has been compared with some very accurate tests conducted a few years ago on walls having various heat capacities, and has been shown to give highly accurate results for walls which have heat capacities comparable to those found in ordinary building construction. For walls having abnormally high capacity the calculations give results which are slightly on the conservative side.

This comparison demonstrated that the heat capacity of normal walls has relatively little effect on the amount of heat transmitted through them, but it does give rise to a time lag of one hour or more, depending on the construction.

Until more complete experimental evidence is available on the difference of time existing between the manifestation and maximum outdoor effects and maximum heat gain from walls of various building materials, and on the amount of reduction in total heat conducted on account of the storage effect, the following procedure is recommended:

1. Calculate the heat from sun effect through windows, appliances, lights, ventilation air, and people on the basis of temperatures, sun effect factors, and other conditions actually existing at the time of maximum total heat gain.

2. Add to the above conduction through walls and sun effect through walls calculated on the basis of temperatures existing from 3 to 6 or more hours earlier in the day than the time at which the maximum total heat gain occurs. Reference may also be made to Chapter 8 of *The A.S.H.V.E. Guide* for time lag factors.

Unusual Sources of Heat Gain

The obvious sources of heat which have been discussed above are sometimes supplemented by hidden and unexpected sources, the possibilities of which must not be overlooked.

One fairly obvious one is the conduction of heat through the walls of the ducts in a central plant system, particularly where the ducts run through unventilated attics, outside walls, etc.

The amount of heat thus conducted to the conditioned air can be calculated from a knowledge of the temperatures inside and outside the duct, and from a consideration of the usual heat transfer phenomena. In general, the following formula may be used with sufficient accuracy.

$$Hd = Ad\ Ud\ (t_1 - t_2) \qquad (12)$$

$$Ud = \frac{1}{\frac{1}{1.2} + \frac{t}{k}} \qquad (13)$$

where

Hd = heat transmitted through walls of duct system, B.t.u. per hour.
Ad = area of duct surface, sq. ft.
t_1 = temperature of air outside the duct, F.
t_2 = temperature of air inside the duct, F.
t = thickness of insulation applied to duct, inches.
k = conductivity of duct insulation, B.t.u. per hour per sq. ft. per F per inch thickness.

Another unusual source of heat gain arises when rooms or furred spaces are used as plenum or return air chambers. Sometimes the walls of such chambers adjoin very hot spaces, like kitchens or attics, and sometimes they are exposed to the outside. When such cases are encountered, it is necessary to calculate the heat gain of the air chamber as well as the heat gain of the air-conditioned space.

Methods for Reducing Heat Gain

The application engineer should always be on the alert for opportunities to reduce the heat gain of a structure where means are available to do so in such a manner as to reduce the net cost of the installation over the period of its life.

The use of insulating materials in walls which have a heavy heat gain is one obvious method of reducing the size of equipment required. The use of awnings, blinds, or shades is an aid in the reduction of sun effect through windows. Of course, such shades, blinds, etc. are of no benefit unless they are drawn.

Spraying of water on roofs which are directly over the air-conditioned spaces is another method which has been tried successfully at times. This water may sometimes be taken from the water discharge circuits of the condensing unit or from an independent circuit.

Attic ventilation is another means of effectively reducing the heat gain through the roof. In many cases, unventilated attics situated beneath roofs which are exposed to the full intensity of the sun may rise to temperatures as high as 130 or 140° F. Since the outdoor air is seldom hotter than 110°, it has the capacity to remove heat from such attics, provided it is forced through by a suitable fan or blower. The fan should be able to provide in the neighborhood of 30 complete air changes per hour in the attic space.

Under such conditions the average air temperature in the attic space would usually be from 5 to 10° warmer than outdoors during the middle of the afternoon, when the sun effect is greatest. There are times, of course, when attic insulation may be more valuable than attic ventilation.

Table 6—Heat Gain from People

TABLE 6—Heat From People (at 80° F.)

1. Average condition (at rest, eating, office work, etc.)	
Sensible heat	220 B.t.u. per hour per person
Latent heat	180 B.t.u. per hour per person
Total	**400 B.t.u. per hour per person**
2. Medium rate of exertion (restaurant waiters, average dancing, etc.)	
Sensible heat	230 B.t.u. per hour per person
Latent heat	420 B.t.u. per hour per person
Total	**650 B.t.u. per hour per person**

Cooling System Is Used in Packing Of Oleo Coloring

MAUMEE, Ohio—Maumee Color Co. has recently made an application of Westinghouse commercial refrigeration equipment to aid in the wrapping of the powdered oleomargerine color which it manufactures. The powder replaces the liquid formerly used in coloring oleomargerine as a butter substitute.

A special machine was designed to wrap the powder, which is milled to an unusually fine and smooth texture. Originally the compound was packed in three-paraffined sacks, but this procedure, aside from being too expensive, presented considerable difficulty in getting the flap sealed.

Cellophane was next tried, but this material could not be handled in quantities sufficient to obtain mass production. Finally the Maumee Co. began to use a paraffined cigarette-thin paper, which proved the ideal packaging material.

Production often reaches 125,000 sections of butter color daily per machine, so that the paraffin must be cooled rapidly, to prevent the package sections sticking together when packed. To overcome this difficulty, a ⅓-hp. air-cooled Westinghouse condensing unit was installed by J. W. Greene Co., Toledo Westinghouse distributor.

Engineers devised a system whereby the paper packages, after passing through the paraffin "bath," pass rapidly through a trough of water at a constant temperature of 40° F. This "sets" the paraffin on the outside of the packages containing the color powder, and prevents sticking.

After passing through the water, the paper goes through rollers and over shears which automatically cut it into 1½-in. squares. It is next placed in bundles of 1,000 packages each.

The Westinghouse equipment replaces a system which used 175 lbs. of ice per day. Aside from economy, a major cause for the substitution of mechanical refrigeration was to eliminate a bacteria growth in the water bath.

When ice was used, it was found that when it became low in the tank an objectionable mold resulted. This mold gave the water a bad taste, which was in turn transmitted to the paraffin and eventually to the powder.

Installation of the mechanical refrigeration equipment eliminates growth of the mold.

20 August Installations Set Baltimore Record

BALTIMORE — Twenty air-conditioning installations were made in this city during August, topping all previous monthly records. Total cost of the systems installed amounted to $150,000, or an average of $7,500 per job. Included in the air-cooling jobs were installations in department stores, drug stores, and other commercial enterprises.

SERVICE

Description of Ammonia, Gas, Electrical & Water Systems In Ice-O-Lator Unit

Ammonia System

Caution

Avoid breaking an ammonia line with *liquid* ammonia in the system. Be sure that the ammonia has been reabsorbed in the generator and that the gauge shows no pressure.

To Break Ammonia System for Removal or Replacement

In order to change ammonia gas or liquid lines, generator, generator extension tube, condenser or absorbing check valves, pressure gauge, rupture diaphragm, condenser, liquid valve, temperature control, generator, or refrigerating chamber, it is necessary to be sure that all of the liquid ammonia has evaporated from the refrigerating chamber and reabsorbed in the generator.

Editor's Note—This is the third and last instalment on the Ice-O-Lator absorption unit. The unit was described in the Sept. 11 and 18 issues and service instructions were also given in the Sept. 18 issue.

Complete Reabsorption

The machine should be in the absorbing position (the heat off and the water passing through the generator) and then the red wire should be disconnected at the Honyewell. The length of time required for absorption depends on the quantity of ammonia in the refrigerating chamber and the temperature in the refrigerator. To insure complete absorption the machine should be left at least one hour after the bottom contact is made. This may require from four to eight hours if the machine has recently completed a heating period.

Test

To determine when the ammonia has all been absorbed, touch the red post on the Honeywell with the loose red wire and a spark will be produced. The brine tank in the refrigerator will have begun to defrost, and the pressure gauge will show a pressure near the zero point.

Building Up the Pressure to Change Parts

When an ammonia connection is to be broken, the gauge should show a slight pressure (5 lbs.). If it does not, heat must be applied. It is necessary to short circuit the red and white posts on the Honeywell which turns the machine into the heating position, thereby heats the generator and raises the pressure to about 5 lbs. Pull the electrical switch when the gauge reads from 5 to 10 lbs. and proceed to make the necessary changes as listed below.

Condenser Check Valve

To change the condenser check valve with pressure on machine as above, unscrew the large nut connected to the condenser check valve. Then remove the condenser check valve from the main assembly.

Having a new check valve ready with an aluminum washer on the end that screws into the assembly and making sure that the valve opens in the direction of the condenser, immediately replace with a new check valve and connect the condenser. Then restart the machine and test for leaks.

Absorbing Check

To change the absorbing check valve with pressure on the machine, disconnect the absorbing line from the check valve and plug so as not to allow air into the refrigerating chamber, remove the absorbing check valve from the assembly and replace it immediately with a new check valve making sure that the valve has an aluminum washer and opens in the direction of the generator, reconnect the absorbing line, test the joints for tightness, and restart the machine.

Rupture Disc When Leaking Only

To change the rupture disc with pressure on the machine, disconnect the relief line from rupture disc, then remove the rupture disc and replace with a new one making sure that it has a washer. Make the assembly tight, restart the machine and test for leaks with test papers.

If any considerable quantity of ammonia has leaked out it will be necessary to recharge the machine. Refer to Recharge Instructions for this operation. Whenever a rupture disc has leaked or been blown it is necessary to run water through the relief line for a period of 15 minutes in order to clear the line. The water should then be blown out of the line so that it will not freeze.

Pressure Gauge

To change the pressure gauge with pressure on the machine, remove the cover from the back of the gauge, then remove the electric wire from the gauge connections. Have a new gauge ready and disconnect the gauge on the machine by unscrewing the nut under the gauge and pressing down on the top of the gauge so as to keep the ammonia from escaping; replace with the new gauge, make tight, replace the electric wires, restart the machine and test for leaks with test paper.

Condenser and Liquid Valve

To change the condenser and liquid valve with pressure on the machine, shut off the water supply, disconnect the water lines at the brass tees at the top and bottom of the condenser; and with a piece of rubber tubing snapped over the blow off valve at the top of liquid valve the other end in jar of water, loosen the blow off plug and allow any ammonia to evaporate from liquid valve that might be there.

Then disconnect the large nut connecting the condenser to the condenser check valve, put a cap on the condenser check valve, disconnect the liquid line from bottom of the liquid valve, plug the liquid line, remove the large nut which holds the liquid valve to the bracket, remove the condenser liquid valve assembly from the bracket and replace with the new assembly, fasten the assembly to the bracket connecting the ammonia lines first, then the water lines, turn on the water, restart the machine and test for ammonia and water leaks.

Temperature Control

To remove the temperature control unit with pressure on the machine, shut off the water, disconnect the water and ammonia lines and plug the ammonia line leading to refrigerator; replace the unit, connect the ammonia lines first and then water lines, restart the machine and test for leaks, make the adjustment the same as on the control unit which was removed.

Generator

To remove the generator with pressure on the machine, shut off the water and gas, disconnect the water connections in back at the top of the generator, disconnect the ammonia line at the same place and plug both the ammonia extension tube and the generator, remove the top casting and front casing surrounding the generator, disconnect the three bolts holding the generator to the frame and remove the generator. Replace with a new one, and test for leaks.

Refrigerating Chamber

To remove the refrigerating chamber with pressure on the machine, disconnect the ammonia lines at the back of the refrigerator plug the refrigerator lines first so as not to allow air to pass into the refrigerating chamber, then plug the machine lines, disconnect the electric wires leading to Honeywell, straighten out the ammonia lines leading to the refrigerating chamber so they can be pulled through from the front of the box when removing the brine tank, siphon the brine out of the brine tank through the small hole in the cover, next remove the four bolts holding the brine tank assembly supports to the top of refrigerator.

Lift the brine tank assembly out of the refrigerator, remove the support rods from sides of tank, remove the cover, empty out the rest of the brine, remove the large nut on bottom of tank, thus allowing the refrigerating chamber to be lifted out of the tank, replace with a new chamber, and reinstall in the reverse order.

To Remove Water from Refrigerating Chamber

After a complete absorption with pressure on the machine, open the small Monel blow-off at the bottom of the refrigerating chamber, and hold a receptacle underneath allowing any accumulated water to drain from the refrigerating chamber. Replace the blow-off plug and start the machine.

To Blow Down an Overcharged Machine

Allow the ammonia to become completely reabsorbed in the generator and if the machine fails to make bottom contact, place a rubber tube on the blow-off valve on the top of the liquid valve, and allow the ammonia gas to blow into water until a bottom contact is made in the refrigerating chamber which starts the Honeywell. Continue the blowing operation until the pressure drops to 5 lbs.

Recharge

To recharge a machine after the rupture disc has blown, or in the case of undercharge, be sure that all the ammonia has been reabsorbed in the generator, then pull the electric plug, shut off the gas, replace the fuses or reset the gauge as in Summary, insert the electric plug, short the blue and white posts on the Honeywell and remove the red wire from same remove the rupture disc blow-off tube and allow water to run through the rupture line tube for about 15 minutes to clear the tube.

Be sure to blow all the water from the tube so as to prevent it from freezing. Replace with a new rupture disc and washer, reconnect the blow-off tube, disconnect the liquid line near machine, plug the liquid line leading to machine, connect the other end of the liquid line to the charging tank.

Turn on ammonia tank (be sure that the tank is in a position to deliver gas only). Allow the ammonia gas to flow into generator until the pressure goes as high as it will then shut off the ammonia tank, loosen the blow off on top of liquid valve, slip a rubber tube over the nut and with the other end in a jar of water, allow the ammonia gas to blow into the water until the gauge shows no pressure.

If during this blowing down process the rubber tube stops discharging ammonia gas instantaneously and starts to jump violently it means that water is being drawn into the tube. To stop this it is necessary to remove the tube from the water and allow the water to blow out.

Tighten the blow-off nut and turn on the ammonia tank allowing more gas to pass into the generator then shut off the tank and blow the pressure down. Continue this operation until no air bubbles come to the surface of the water.

Finally allow ammonia gas to pass into generator until the pressure rises as before and allow the system to stand for 10 minutes, then turn off the tank and allow the system to stand for 15 minutes.

If the gauge does not return to zero, then blow the system down to a pressure of 5 lbs. through the liquid valve blow off, disconnect the tank, connect the ammonia lines, connect the red wire at the Honeywell, turn on the gas, light the pilot, restart the machine, and test for ammonia leaks. If the Honeywell does not start, loosen the liquid valve blow off, attach the rubber tube, and blow the ammonia gas into water until the Honeywell starts.

To Purge Air from Liquid Valve

To purge the air from the liquid valve see Installation Instructions.

To Purge the Machine

To purge a machine after air has leaked into the system, connect the ammonia tank to the ammonia gas line with the ammonia liquid line plugged. Turn on the ammonia tank (tank in upright position delivering gas) allow the pressure to go as high as it will. Shut off the tank, loosen the blow-off plug on top of the liquid valve, snap a rubber tube over the blow-off valve with the other end in a jar of water.

Allow the ammonia gas to blow into water (the air bubbles rising to the surface) until the pressure drops to zero; shut off the blow-off valve and turn on the ammonia tank and again allow the pressure to go as high as it will, blow down and repeat this operation until no air bubbles come to the top. With the pressure of 5 lbs. on gauge, shut off the tank and remove it, and test for ammonia leaks.

To Purge the Machine and Refrigerating Chamber

When the machine is connected to the refrigerating chamber be sure that the ammonia is all reabsorbed in the generator, connect the ammonia tank (tank delivering ammonia gas) to the liquid line leading to the refrigerating chamber, plug the liquid line leading to machine, blow down through liquid valve blow off as above.

To Purge the Refrigerating Chamber

To purge a refrigerating chamber, connect the ammonia tank to the liquid line on the chamber with the other line plugged. Turn on the ammonia tank (delivering ammonia gas) and then shut off quickly since only a small volume of gas is needed. Loosen the nut on the bottom of the refrigerating chamber and snap a rubber tube over the same, then with the other end of the rubber tube in a jar of water, allow the ammonia gas to blow into water.

The air bubbles will come to the surface of the water until the pressure drops to zero. Tighten the nut and allow another charge of ammonia gas to pass into the chamber from the tank. Continue this purging operation until no air bubbles come to the surface of the water. Seal the chamber with ammonia pressure in it. Shut off and disconnect the ammonia tank, and plug the line quickly in order not to lose the ammonia in the chamber.

During the purging operation, if the rubber tube stops discharging ammonia gas, water is being drawn into the tube. It is necessary to quickly remove the tube from the jar of water, and allow the water to blow out, and then replace it. Be sure that no water is drawn into the refrigerating chamber during the blowing down.

To Charge Service Tank

To charge the small tank from a large tank, it is necessary to cool the small tank so as to produce a lower pressure. Connect the small tank to the large one, with a piece of copper tubing, making sure the large tank is in a position to deliver liquid; open the valve on the small tank, then the valve on the large tank, allow liquid to flow into the small tank.

The flow of the liquid is indicated by the quivering of the tube. When this stops shut off both valves, disconnect the line at the small tank, open the small tank valve and allow some ammonia gas to escape from the small tank into the open air. This cools the tank by evaporation. Connect the small tank to the large one again, and repeat the operation.

It usually requires three of the above operations to fill the small tank. The tank will hold approximately 5½ lbs., but only 5 lbs. should be loaded into it allowing the remaining space for expansion. The empty weight of the tank is stamped on it and the safe limit of weight when the tank is full. *Do not exceed this limit.* Do not place the cylinder containing ammonia near a stove, steam pipe, radiator, or in the direct rays of the sun. It should be stored in a dry place to prevent rusting.

Electrical System

Reset Pressure Gauge

To reset the pressure gauge after it has operated due to a high pressure, pull the electric plug, and remove the cover from the back of the gauge. Push the two copper strips carrying silver contacts together at the same time pushing the Bakelite latch so as to hold them, replace the cover on the gauge and the machine is ready to start. If the contacts show any burning be sure that they are cleaned with a thin file before resetting. *Never change the set screw adjustment.*

Clean Thermostatic Pilot Control Points

To clean pilot control contact, which if corroded will prevent a circuit through the gas valve when the bottom contact is made, pull the electric plug, but do not turn off the gas. Remove the pilot control cover and draw a piece of clean paper between the two contacts while pressing them together. Replace the electric plug and see if burner operates.

If it does, pull the electric plug and pass a thin flat file across the points and test again for burner operation. If the circuit does not make satisfactorily, replace the pilot control assembly.

Replace Honeywell Motor

To remove the Honeywell shut off the electricity and water, disconnect the three water lines leading to water valve, disconnect the electric wires leading to the Honeywell. Remove the unit, make the necessary changes and replace it.

Gas System

Gas Valve Assembly

To remove the gas valve assembly shut off the electricity and gas, loosen the bolts on the front and back at the head of the gas burner which connects the burner to the plate and push the supports away from the bolts which support the gas burner head. Disconnect the electrical wires from the pilot control and magnet coil on the gas valve, remove the nut holding the support on the end of the coil, disconnect the union on the gas line and remove the assembly, make the necessary changes or repairs, reassemble and test for leaks.

Gas Spud, Gauze in Burner or Pilot Control

To change the gas spud, the gauze in the burner or the thermostatic pilot control, shut off the gas and electricity, loosen the bolts on the front and back at the head of the gas burner which connect the burner to the plate, push the supports away from the bolts which support the head, unscrew the small set screw at base of air mixing chamber holding burner to the nozzle, disconnect the pilot tube from the gas valve and lift the burner off the nozzle.

Clean Gas Valve

Shut off the gas and with the spanner wrench remove the cap on the top of the valve, remove the ball with aid of a piece of looped wire, clean the seat and the ball, replace the ball and cap and test for gas leaks. It may be necessary to change the ball if its surface is rough.

Gas Spud

Unscrew the spud on top of the nozzle and change it to improve combustion.

Gauze

Lift the burner head from the air mixing chamber and remove the gauze.

Pilot Control

Remove the metal cover over the contact points, disconnect the electric wire, disconnect the union in the copper pilot feed tube, unscrew the two screws at the top and one at the bottom of the pilot control assembly and remove same from the burner. When the necessary changes are

(Concluded on Page 21, Column 1)

Service Instructions On Ice-O-Lator Unit

(Concluded from Page 20, Column 5)

made, reassemble and test for gas leaks.

Water System

Water Valve

To change the water valve, shut off the water, disconnect the water lines and unscrew the cap screws holding the valve on the bracket on the side of the Honeywell. Note on removing the water valve the direction of the flow of the water and assemble the new valve so that water flows the same way.

By turning the shaft on the *Honeywell side* of the valve one half turn, the water is shifted from one side to the other. To replace the valve, put the round brass spacer on the Honeywell shaft, insert the small steel key in the slot of the same and with the heavy spring on the shaft of the water valve, push the water valve shaft into place, making sure that the key in the Honeywell shaft lines up with the slot in the water valve shaft, replace and test for leaks and direction of water flow.

Clean Strainer or Replace Gauze

To clean strainer, shut off the water, remove the strainer from the line, unscrew the cap at the top of the strainer with the special spanner wrench, unscrew the inner section of strainer, remove the gauze, clean or replace with a new gauze, replace and reassemble.

Clean Water Valve

To clean the water valve, shut off the water and disconnect the water feed line at the end of the water valve, with the spanner wrench remove the cylindrical housing of the valve and the spring; note the position of the two holes in the disc valve in order to reassemble it in the same position, carefully remove the valve and see if the two holes through which the water passes are clear.

If not, clear the passage, clean the valve and seat with a soft cloth, replace the valve making sure the holes are in the correct position, replace the spring and housing, connect the water lines and check the flow of water and test for leaks between ports.

Warm Water Delivered to Machine

If it is found that the feed water line to the machine is warm, investigate this carefully to see if the water from a hot water boiler can back up into the system or if the water supply line passes over a heater or furnace before it reaches the machine. If this proves to be the case, change the location of the water supply to the machine to correct this condition.

Temperature Control (Adjustment)

The temperature control is operated by the low pressure ammonia gas returning to the generator during the absorbing period. It controls the quantity of water flowing through the generator water coil during this period, thereby controlling the refrigeration.

The temperature control has four settings of 5 lbs. variation each, ranging from 15 to 35 lbs. Four fixed marks are placed on the brass body at the top of the opening on the water inlet side of the control which show the variations of adjustment. The bottom of the large round adjusting nut (within the brass body at the top of the opening) should line up with a fixed mark.

When the adjustment is set for a 15 to 20 lb. operation, the water valve is completely closed, with an ammonia pressure of 15 lbs. on the diaphram; when it increases to 20 lbs. the water valve is opened wide allowing the full flow of water through the generator.

This, of course, cools the generator, and in so doing lowers the pressure, which results in a greater pressure difference between the generator and refrigerating chamber. The ammonia in the refrigerating chamber is thereby caused to evaporate more rapidly, and the temperature is correspondingly reduced.

When the generator pressure is reduced to 15 lbs. the water flow is completely shut-off, and the evaporation of ammonia in the refrigerating chamber slows down until it practically stops so that no refrigeration takes place until the pressure in the refrigerating chamber builds up sufficiently to again open the regulator water valve, and allow cooling water to flow through the generator.

Temperature controls are adjusted to operate from 25 to 30 lbs. when leaving the factory. This means that the water flow to the generator will be practically shut-off at 25 lbs. and a full flow of water will be permitted at 30 lbs. This corresponds to a temperature variation of from 18 to 23° F. in the brine tank.

In order to lower the temperature in the brine tank, it is necessary to turn the large adjusting nut mentioned above to the left; to raise the temperature in the brine tank, it should be turned to the right.

This should never be turned up completely above the adjustment corresponding to the high pressure. If it is turned up to the limit, it is necessary to back it off at least one half turn in order to make it function.

The small adjusting nut is for factory adjustment only, and should not be adjusted in the field.

If at water leak develops around the small brass water plunger, tighten the packing *very slightly*. If this packing gland is too tight, the water will not be cut off.

Summary

Following is a summary of instructions for adjustment or replacement of defective parts:

A. Pressure cutout operated and fuse was blown, or contacts separated (20-volt system), opening the electrical circuit. It is necessary to remove the cover from the back of the gauge and reset the contacts. If the contacts are burned, be sure that they are filed before resetting. For 110 volt system replace fuses and file contacts to clean them. The trouble which caused the cutout to operate was due to one or more of the following:

1. Water failure due to shut-off, plugged water strainer, or water line.
   Remedy: Clean affected parts.
2. Air in system.
   Remedy: Purge air from top of liquid valve.
3. Cutout contacts set for too low a pressure.
   Remedy: Replace.
4. Electrical ground or loose connection.
   Remedy: Replace defective parts.
5. Top contact failure in refrigerating chamber (remote).
   Remedy: Replace.
7. Hot water backing up into water feed line.
   Remedy: Change location of water supply.
8. Absorbing check valve leak (indicated by warm gas line at refrigerating chamber during heating.
   Remedy: Replace.

B. Temperature cutout operated.

It is necessary to remove the cutout and replace with a new one, making sure that it is anchored securely.

The probable trouble and its remedy are among the following:

1. Under charge.
   Remedy: Recharge.
2. Top contact failure.
   Remedy: Replace.
3. Ammonia leak.
   Remedy: Replace defective parts.
4. Refrigerating chamber float failure.
   Remedy: Replace.
5. High pressure gas.
   Remedy: Install gas regulator or adjust gas supply valve.

C. Refrigerator operating normally with little or no refrigeration.

1. Absorbing check valve leak (indicated by warm gas line at refrigerating chamber during heating).
   Remedy: Replace.
2. Liquid valve leak.
   Remedy: Replace.
3. Honeywell motor operation continuous due to transformer or ground.
   Remedy: Replace defective parts.
4. Bottom contact failure.
   Remedy: Replace.
5. Open circuit or loose connection in electrical system.
   Remedy: Tighten, adjust, or replace.
6. Water in refrigerating chamber.
7. Temperature control set for too high an ammonia pressure.
   Remedy: Adjust.
8. Overcharge (remote).
9. Gas valve stuck open or closed.
   Remedy: Clean or replace.
10. Pilot control circuit broken.
    Remedy: Adjust contacts or replace.
11. Gas burner or pilot plugged.
    Remedy: Clean burner and gauze.

D. Prolonged heating period.

1. Water valve leak on absorbing side.
   Remedy: Clean and replace.
2. Top contact failure.
   Remedy: Replace.
3. Undercharge.
   Remedy: Recharge.
4. Rupture disc blown or ammonia leak into water system.
   Remedy: Replace.
5. Gas back fire.
   Remedy: Clean gauze and install burner with air shutter if necessary.

E. Refrigerator operating normally but showing high pressure.

1. Condensing check valve swollen.
   Remedy: Replace and recharge.
2. Air in system.
   Remedy: Purge.
3. Liquid valve plugged.
4. Liquid valve float failure.
5. Warm water delivered to condenser.
   Remedy: Change location of water supply.

F. Refrigerator operating normally but showing low pressure.

1. Water valve leak on absorbing side.
   Remedy: Replace.
2. Absorbing check valve leak (indicated by warm gas line at refrigerating chamber toward the end of the period).
   Remedy: Replace.
3. Liquid valve leak or float failure.
   Remedy: Replace.

G. Refrigerator operating normally but either too warm or too cold.

1. Temperature control not functioning properly.
   Remedy: Adjust.
2. Partially plugged water lines.
   Remedy: Clear.

Service Data on Other 'Orphan' Machines

This article is one of a series published by Electric Refrigeration News to give the service man help in servicing various makes of machines. Most of the makes described to date have been "orphan" machines on which service information is no longer readily available.

Service instructions on the following makes were published in these issues:

Absopure household	March 25, 1931
Majestic hermetic	Aug. 16, 1933
Allison	May 30 & June 6, 1934
Welsbach	June 13, 20 & 27, 1934
Rice household	July 4, 1934
Wayne household	July 11, 1934
Absopure com'l	July 18, 25 & Aug. 1, '34
Iceberg	Aug. 8, 1934
U. S. Hermetic	Aug. 15, 1934
Belding-Hall ElectrICE	Aug. 22 & 29, 1934
Majestic standard	Sept. 12, 19 & 26, '34
Holmes household	Oct. 10, 17 & 24, 1934
Iroquois	Feb. 20 & 27, 1935
Socold	May 15 & 22, 1935
Ice-O-Lator	Sept. 11, 18 & 25, 1935

Brown-Johnston Buys Large Building

SPOKANE, Wash.—As part of an expansion program, the Brown-Johnston Co., distributor of commercial refrigeration and air-conditioning equipment and manufacturer of lighting equipment, recently purchased the former Armour building, located downtown, from the Northern Pacific Railway. Remodeling will be completed soon.

The transaction includes a long term lease on ground from the railroad plus trackage facilities adjacent to the building. The three floors give 36,000 sq. ft. additional space, allowing segregation of departments. Each department will merchandise its own specialized lines.

Housed in the new building will be the air conditioning, commercial refrigeration, electrical contracting, wiring, and shipping departments; the factory, including plating and shade manufacturing departments; and wholesale merchandise display space.

In charge of the various departments will be the following:

M. E. Runner, air-conditioning and commercial refrigeration departments; L. Lovejoy, factory superintendent; Walter Toly, plating department; Miss Jane Dunning, shade manufacturing; Roy Lamphere, radio wholesaling; and L. Weiss, general wholesale activities on appliances.

Seeger & Frigidaire Equip Mass. Teachers' College

FRAMINGHAM, Mass.—Refrigeration equipment recently installed in the State Teachers' College here includes a 68-cu. ft. Seeger dairy product and vegetable cabinet, a walk-in meat cooler built by Armstrong Cork Co., and a 44-cu. ft. Seeger cabinet for use in the bakery, all equipped with a Frigidaire cooling system; a 15-cu. ft. Frigidaire refrigerator for the kitchen serving room; a three-hole ice cream cabinet; and a water cooler.

Powell Heads Appliance Sales in Dept. Store

BALTIMORE—Harry Y. Powell has been appointed merchandise manager for refrigerators and electrical appliances carried by Brager-Eisenberg, Inc., department store in this city. These activities have been combined into one department on the first floor.

Mr. Powell has had experience in selling electrical merchandise with four concerns. He was divisional merchandise manager of refrigerators and electric appliances at McCurdy & Co., Rochester, N. Y., and district sales manager of the Baltimore outlet of Apex Rotarex Corp., Cleveland.

Previous to this he headed the Electrical Shop of The Hub, Baltimore department store. He was for seven years manager and buyer for appliances at Hecht Bros. Co., of this city.

PATENTS

Issued Sept. 10, 1935

2,013,692. REFRIGERATING PROCESS AND APPARATUS. Charles W. McCoy, Spokane, Wash. Application May 2, 1930. Serial No. 449,101. 9 Claims. (Cl. 62—91.5.)

2,013,756. AIR CONDITIONING APPARATUS. Milton Kalischer, Springfield, Mass., assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., a corporation of Pennsylvania. Application Nov. 15, 1933. Serial No. 698,205. 26 Claims. (Cl. 257—70.)

2,013,777. ROTARY COMPRESSOR. James H. Dennedy, Evansville, Ind., assignor to Rotorite Corp., Chicago, Ill., a corporation of Illinois. Application June 24, 1931. Serial No. 546,533. 12 Claims. (Cl. 230—152.)

2,013,848. AIR COOLING AND CONDITIONING UNIT. Frederick J. Heideman, Detroit, Mich. Application Nov. 3, 1933. Serial No. 696,577. 14 Claims. (Cl. 62—95.)

2,013,862. COMPRESSOR. Arthur E. Schulz, Chicago, and Donald J. Phelps, Berwyn, Ill., assignors to Frank E. Mandel, Chicago, Ill. Application Jan. 19, 1935. Serial No. 2,474. 10 Claims. (Cl. 230—214.)

2,013,946. REFRIGERATION. Hubert D. Bennett, Toledo, Ohio, assignor to Toledo Scale Mfg. Co., Toledo, Ohio, a corporation of New Jersey. Application June 6, 1934. Serial No. 729,282. 4 Claims. (Cl. 62—94.)

2,014,096. ABSORPTION REFRIGERATING APPARATUS. Edmund Altenkirch, Neuenhagen near Berlin, Germany, assignor to The Hoover Co., North Canton, Ohio, a corporation of Ohio. Original application April 13, 1926. Serial No. 101,745. Divided and this application May 25, 1933. Serial No. 672,755. In Germany April 23, 1925. 2 Claims. (Cl. 261—106.)

2,014,147. AIR CONDITIONING OR FROSTED DISPLAY DEVICE. John J. Shively, Brookville, Pa. Application Oct. 5, 1931. Serial No. 566,968. 7 Claims. (Cl. 62—1.)

2,014,346. REFRIGERATING APPARATUS. Charles C. Thomas, Detroit, Mich., assignor to Kelvinator Corp., Detroit, Mich., a corporation of Michigan. Application Jan. 24, 1934. Serial No. 708,039. 13 Claims. (Cl. 62—89.)

REISSUE

19,700. REFRIGERATION APPARATUS. Edward T. Williams, Pelham Manor, N. Y. Original No. 1,947,574, dated Feb. 20, 1934. Serial No. 410,026, Nov. 27, 1929. Reissue No. 19,595, dated May 28, 1935. Serial No. 754,123, Nov. 19, 1934. This application for reissue July 17, 1935. Serial No. 31,940. 45 Claims. (Cl. 62—115.)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF MARCH 3, 1933

Of Electric Refrigeration News published Weekly at Detroit, Mich., for Oct. 1, 1935.

State of Michigan
County of Wayne } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Geo. N. Congdon, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Electric Refrigeration News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of Aug. 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, F. M. Cockrell, Detroit, Mich.
Editor, Geo. F. Taubeneck, Detroit, Mich.
Managing Editor Phil B. Redeker, Detroit, Mich. Business Manager, Geo. N. Congdon, Highland Park, Mich.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)
Business News Publishing Co., Detroit, Mich.
F. M. Cockrell, Detroit, Mich.

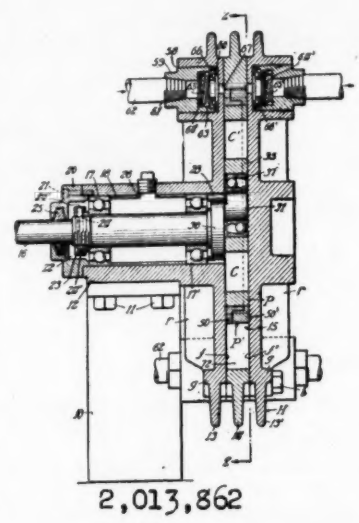
3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholders or security holders appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is ..... (This information is required from daily publications only.)

GEO. N. CONGDON,
Business Manager.

Sworn to and subscribed before me this 16th day of September, 1935.
(SEAL) Roy N. Sharp.
(My commission expires June 29, 1938.)



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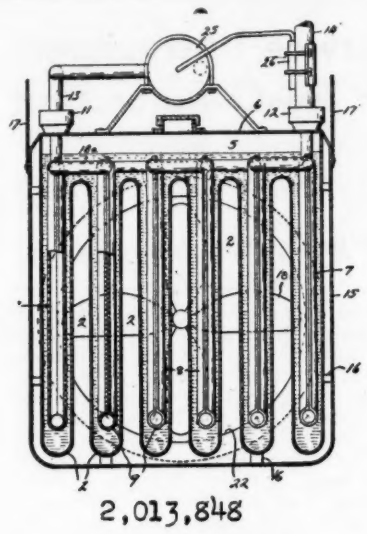

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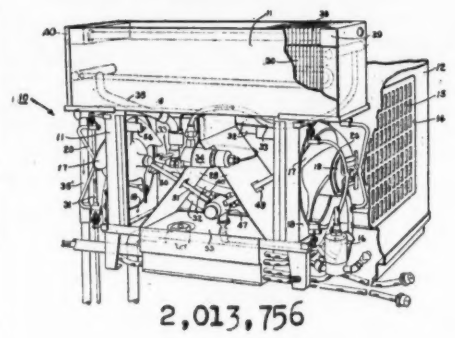

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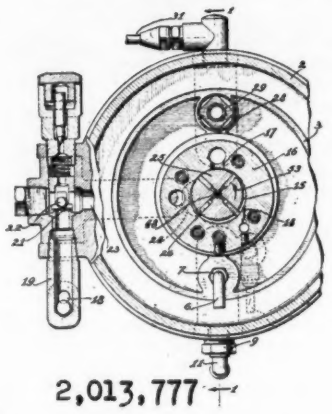

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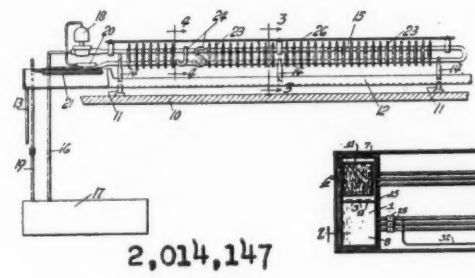

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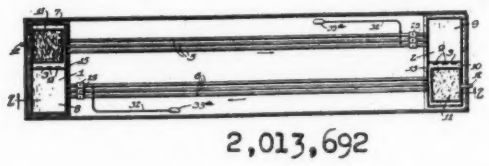

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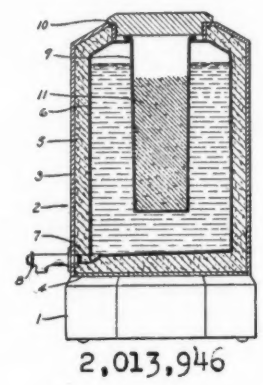

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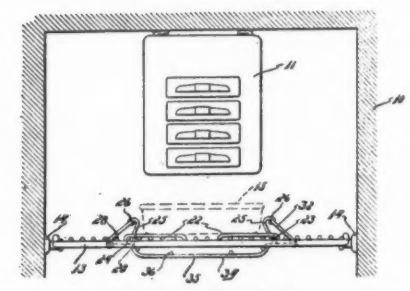

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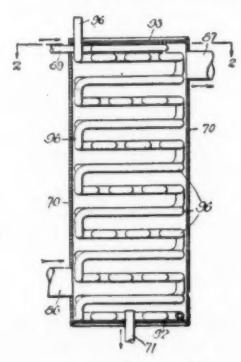

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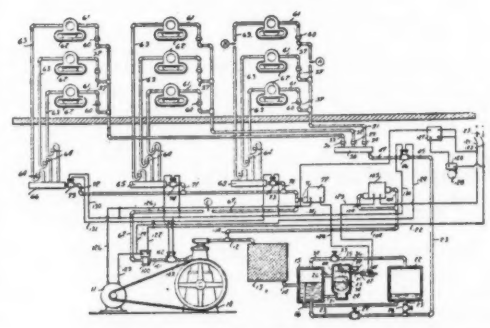

19,700

BOOKS

Thermostats & Temperature Regulating Instruments

Author: Roosevelt Griffiths. Publisher: Charles Griffin & Co., Ltd., London. American Distributor: J. B. Lippincott Co., Philadelphia. Pages: 153. Price: $5.

THE aim of this little volume is to give a brief sketch of the numerous types of thermostats, descriptions of which are scattered, in most cases, over a wide range of scientific periodicals. This volume should prove of value to the investigator who has need for automatic control of the temperature of an enclosure or bath. To him, the right selection of a thermostat is vital, and no piece of apparatus can waste more time and energy than a thermostat ill-adapted to its job.

Aside from its utilitarian value, the subject of thermostats is also of interest in illustrating the diversity of phenomena which have been pressed into service in the design of scientific apparatus.

In addition to the laboratory types of apparatus, an account is also given of coarser forms, which find application in certain industrial operations.

To the testing engineer, who must have the latest data on the control of temperature, then, this book should prove most valuable.

Subjects covered include the following:

Thermostats based on expansion of liquid; thermostats based on expansion with temperature of gases; industrial types of thermostats based on the expansion of liquid; mercury expansion thermostats; thermostats based on the boiling points of liquids; thermostats based on the expansion of solids; bi-metallic type of regulator; resistance thermostats; temperature control using radiant energy; contact type of regulator; potentiometric regulators; induction regulators; low-temperature control; relays; and valves. The book contains 88 illustrations.

23 Perfection Dealers Visit Crosley Plant For Sales Records

CINCINNATI—Twenty-three dealers of the Perfection Mattress and Spring Co., Crosley distributor in Birmingham, Ala., and officials of the Perfection company, were guests of the Crosley Radio Corp., here recently. The dealers were Crosley sales contest winners.

Representatives of the distributing company included James Clary, manager of the electric appliance department, Harry Douce, advertising manager, and L. N. Herring, sales representative.

Visits to the Crosley factory, the studios of WLW, and a trip to see the 500,000 watt transmitter at Mason, were part of the scheduled activities. Dealers were guests of the Crosley Corp., at a ball game between the Cincinnati Reds and the Brooklyn Dodgers, and were later feted at a dinner at the Hotel Gibson.

Group Subscription Rates

The following special rates are for PAID-IN-ADVANCE subscriptions only in the United States and Possessions and Pan-American Postal Union Countries. Charge orders are billed at the single-subscription rate, regardless of number. Papers will be mailed to individual addresses.

	Electric Refrigeration News (weekly)	1935 Refrigeration Directory and Market Data Book (2 volumes)	Both Electric Refrigeration News and Directory and Data Book
1 subscription	$3.00	$5.00	$6.50
5 or more each	2.75	4.50	6.50
10 or more each	2.50	4.00	6.50
20 or more each	2.25	3.50	5.75
50 or more each	2.00	3.00	5.00
75 or more each	1.75	2.50	4.25
100 or more each	1.50	2.00	3.50
For All Other Countries (Except Canada)			
1 subscription	$5.00	$6.00	$9.00
5 or more each	4.75	5.50	8.50
10 or more each	4.50	5.00	8.00
20 or more each	4.25	4.50	7.50
50 or more each	4.00	4.00	7.00
Canadian Rates (including tariff of 5 cents per copy on the News)			
1 subscription	$6.00	$6.00*	$11.00*
5 or more each	5.75	5.50*	10.50*
10 or more each	5.50	5.00*	10.00*
20 or more each	5.25	4.50*	9.50*
50 or more each	5.00	4.00*	9.00*

*Canadian subscribers are required to pay a tariff and excise tax on the Directory and Market Data Book which amount to $1.00. These extra charges on books will be collected by the Canadian postoffice at the time of delivery.

Master Service Manual Order

Date.....

BUSINESS NEWS PUBLISHING CO.
5229 Cass Ave., Detroit, Mich.

☐ Please enter my advance order for the MASTER SERVICE MANUAL, and send me reprints (in pamphlet form) of the first six chapters as published in the weekly issues of Electric Refrigeration News from April 10 to Aug. 21, 1935. Enclosed is $3.00.

☐ Please enter my subscription to ELECTRIC REFRIGERATION NEWS to start with the issue of Aug. 28, 1935, and send me reprints (in pamphlet form) of the first six chapters of the MASTER SERVICE MANUAL as published in previous issues of the NEWS. Enclosed is $3.00. I understand that this does NOT entitle me to the **complete book** or **reprints** of future chapters to appear in the NEWS.

Name .....

Attention or In care of .....

Street .....

City ..... State .....

Remarks .....
(Please indicate products sold or principal line of business.) 9-25-35

Subscription Order

Business News Publishing Co.
5229 Cass Ave., Detroit, Mich. Date.....

☐ Enter my subscription to Electric Refrigeration News for one year (52 issues).
☐ Send the 1935 Refrigeration Directory and Market Data Book (2 volumes).
☐ Enclosed find remittance. (See rates above.)

Name .....

Attention or In care of .....

Street Address .....City and State.....

We sell the.....refrigerator and.....
(Please indicate other products or principal line of business.)
9-25-35

QUESTIONS

Wood for Humidistats

No. 2474 (Manufacturer, Ohio)—"We desire to get a source of supply of wood suitable for use in humidistats."

Answer: The following companies supply wood for special technical uses, and might be able to furnish the necessary material:

Haskelite Mfg. Co., 208 W. Washington Blvd., Chicago; National Plywood Co., Inc., 441 E. 19th St., New York City; Chicago Mill & Lumber Co., 111 W. Washington St., Chicago.

Pulling Vacuum

No. 2475 (Service Man, Illinois)—"Will you please answer a few questions for me:

"Is it necessary to use a vacuum pump to pull a vacuum on a box when you install a unit in a box, or is it o.k. to use the compressor of the unit you install in box to pull a vacuum when connecting unit up to box? The refrigerant used is methyl chloride.

"My idea is to put a vacuum gauge on low side and leave liquid line closed at receiver tank, then nearly open the valve next to vacuum gauge and take plug out on high side and pump a vacuum down 20 inches. Is this o.k.?"

Answer: The problem which you present is covered by Service Operation Lesson No. 2 in the series by K. M. Newcum which has been appearing in the weekly issues of ELECTRIC REFRIGERATION NEWS. This Service Operation Lesson No. 2 was published on page 20 of the April 24 issue.

Silica Gel Machines

No. 2476 (Refrigeration and air conditioning engineers, Georgia)—"We will appreciate it very much if you will refer to your REFRIGERATION AND AIR CONDITIONING MARKET DATA BOOK and give us the names of several reliable manufacturers of silica gel absorption machines.

"Using natural gas as a fuel for use with these silica gel machines we believe we will have an opportunity in this section of the country for air conditioning that we have never had before."

Answer: We suggest that you contact the Bryant Heater & Mfg. Co., 17825 St. Clair Ave., Cleveland, Ohio, and the Silica Gel Corp., Baltimore Trust Bldg., Baltimore, Md.

The Silica Gel company may not make a gas fired conditioner, but we believe that they can supply you with the names of manufacturers who do.

Aspley's Book

No. 2477 (Manufacturer's Representative, New York)—"Kindly let me know where I can purchase the book: 'Getting the Most Out of Salesmen,' by J. C. Aspley."

Answer: This book was reviewed extensively in the August 14 issue of ELECTRIC REFRIGERATION NEWS. Copies at $1.50 each may be obtained direct from the publisher, Dartnell Corp., 4660 Ravenswood Ave., Chicago, Ill.

York Conditioner

No. 2478 (Dealer, Georgia)—"In your issue of August 14, you tell of a York portable air conditioner being shown in the DuPont exhibit. Be kind enough to furnish us with the name and address of the manfacturer."

Answer: The York Ice Machinery Corp., Roosevelt Ave., York, Pa.

Wants Line to Promote

No. 2479 (Exporter, New York)—"I am in possession of a copy of your 1934 REFRIGERATION DIRECTORY and find only a few names of household, complete self-contained manufacturers.

"May I ask if you know of any household refrigerator having a large sale in the west or south of the same capacity and price of the Norge, Gibson, Sparton, Frigidaire, Majestic, etc.?

"It might be that such a manufacturer, *not* including the above, is desirous of opening a market in that territory and I would like to communicate with them in that respect, as I have a wonderful clientelle among the largest banks, managing companies, insurance companies, and title companies here, having been in this line of business for practically five years.

"Someone told me that a certain box called 'Potter' is extensively used in the west and I would appreciate it if you can give me the name of the manufacturer.

"I am also able to create a sound export business in this line as I have been identified with the export business for 20 years in practically all foreign countries."

Answer: Please refer to pages 262 and 264 of your copy of the 1934 edition of the REFRIGERATION DIRECTORY and you will find the names and addresses of 61 companies listed as manufacturers of complete, self-contained household electric refrigeration systems.

This includes the name of Potter Refrigeration Corp., 220 Delaware Ave., Buffalo, N. Y.

There are some changes in the list of manufacturers under this classification in the 1935 edition of the REFRIGERATION DIRECTORY and only 49 companies are so listed this year.

I.M.E. Ratings

No. 2480 (Service Man, Michigan)—"As a service man, I realize the value of your service articles, and the need for a complete service manual. Will you please send me reprints of all service articles previous to the Aug. 28 issue of the NEWS.

"I would also like to know why the companies do not publish the I.M.E. ratings in their units. It is rather embarrassing to a salesman when the question arises, especially when selling water bath beer equipment."

Answer: We do not understand what you mean by "why the companies do not publish the I.M.E. ratings in their units."

We have published specifications of both household and commercial refrigerating machines for the past couple of years, and in their specifications most manufacturers give the capacities of their machines under a standard method of rating. Specifications of household refrigeration systems were published in the March 20 issue and the June 12 issue this year, and commercial refrigerating machines, in the April 3 issue.

F-M Specifications

No. 2481 (Dealer, Florida)—"Will you be kind enough to give me the exact cubic feet of the Fairbanks-Morse, four refrigerators, including the Conservador. I have the March 20 issue of ELECTRIC REFRIGERATION NEWS. Have been led to believe by one of their salesmen that the number of cubic feet mentioned in the March 20 issue does not include the Conservador."

Answer: From what we have been able to learn, the specifications given in our March 20 and June 12 issues give the total capacity of the Fairbanks-Morse refrigerators including the Conservador.

Fiber Breaker Strips

No. 2482 (Manufacturer, Wisconsin)—"Please advise names of manufacturers of fiber to be used as breaker strip in refrigerator cabinet construction."

Answer: Try the following:

E. I. DuPont de Nemours & Co., Inc. Fabrics Division
350 Fifth Ave., New York, N. Y.
Felt Products Mfg. Co.
1508 Carroll Ave., Chicago, Ill.
Taylor & Co., Inc., Norristown, Pa.

Sales for 7 Months

No. 2483 (Manufacturer, Minnesota)—"Can you give me an estimate of the total sales of electric refrigerators for the first seven months of this year, also a comparison with 1934 and with July alone?"

Answer: Total electric refrigerator sales for the first seven months of this year were estimated at 1,345,000 units as compared to 1,103,500 units last year. July sales this year totalled 167,000 as compared to 122,000 last year.

American Blower Book

No. 2484 (Dealer, Pennsylvania)—"In ELECTRIC REFRIGERATION NEWS dated Sept. 4, 1935, I saw an article about a book, 'Air Conditioning and Engineering,' edited by the engineering staff of American Blower Corp., and Canadian Sirocco Co., Ltd. Please tell me where I can secure this book or similar information."

Answer: This book was published by the American Blower Corp., 6000 Russell St., Detroit, Mich.; and information about the cost of the book and how it may be obtained can be had by writing to this company.

Electrolux Distributors

No. 2485 (Dealer, New York)—"I have been reading ELECTRIC REFRIGERATION NEWS for about five years and have never had occasion to ask for any additional information until recently, when I sent you my order for the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY AND MARKET DATA BOOK. At that time I asked you to send me the names of distributors of the Electrolux gas refrigerator (other than gas companies).

"As well as the above information I am desirous of obtaining the names of gas companies and gas and electric companies, in cities of over 75,000 population east of the Rocky Mountains. If you cannot supply this information kindly inform me where I may obtain it."

Answer: The manufacturers represent the only authoritative source of information on the number of dealers they have enfranchised.

With reference to the names of gas companies and gas and electric companies in cities of over 75,000 population, we believe this list might be obtained from the American Gas Association, 420 Lexington Ave., New York City.

CLASSIFIED

RATES: Fifty words or less, one insertion $2.00, additional words four cents each. Three insertions $5.00, additional words ten cents each.

PAYMENT in advance is required for advertising in this column.

REPLIES to advertisements with Box No. should be addressed to Electric Refrigeration News, 5229 Cass Ave., Detroit, Mich.

POSITIONS AVAILABLE

NEW YORK CITY rebuilt refrigerator and service company requires services of a man experienced in organizing a systematic and profitable service department, servicing all makes of domestic electric refrigerators for real estate concerns and landlords. State qualifications and salary. Box 731, Electric Refrigeration News.

FRANCHISE WANTED

LOCAL DISTRIBUTOR with complete facilities available in Philadelphia, Pa. Attractive sales floor. Ample storage space, and aggressive personnel. Interested in exclusive distributorship of nationally advertised merchandise. Address Box 730, Electric Refrigeration News.

EQUIPMENT WANTED

WANTED FOR EXPORT by responsible distributor quantity of discontinued electric refrigerators, any year, make or size. Also any nationally known used electric refrigerators in any quantities. We can use any amount of commercial units, or any refrigerator equipment. We pay cash. Artic Export Sales Co., 6 West 15th St., New York, N. Y.

EQUIPMENT WANTED AND FOR SALE

WE WILL purchase for cash any quantities of electric motors, supplies, materials and equipment of any nature. We have a supply of new ⅛ HP Wagner refrigeration motors—DC—AC 25, 40 and 50 cycles at bargain prices. United Electric Salvage Co., 514 W. 36th St., New York, N. Y.

SCHOOLS

REFRIGERATION-AIR CONDITIONING. Theory and practice taught thoroughly by our course combining class room and laboratory work. Our course teaches installation, servicing, estimating and engineering sales. Resident School. Inquiries or inspection invited. Three months full time course available. Detroit School of Refrigeration, 6517-6519 Grand River, Detroit, Mich.

REPAIRS

HALECTRIC thermostat repair service. B & B, G.E., Cutler-Hammer, Penn, Ranco, Tag., etc. Expansion valves repaired. Gas service, Ethyl, Methyl, Iso-Butane, Sulphur. Your cylinder or ours. Competitive prices. Halectric Laboratory, 1793 Lakeview Road, Cleveland, Ohio.

PATENTS

HAVE YOUR patent work done by a specialist. I have had more than 25 years' experience in refrigeration engineering. Prompt searches and reports. Reasonable fees. H. R. Van Deventer (ASRE), Patent Attorney, 342 Madison Avenue, New York City.